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The Mystic River: Inventory, Analysis, and Opportunity



Issues Facing the Design and Development of a Comprehensive Master Plan

Prepared for the Metropolitan District Commission
by Krista L. Schneider

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The Mystic River: Inventory, Analysis, and Opportunity

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Statement of Purpose

The purpose of this study is to identify the key issues which must be addressed in a comprehensive master plan for the Mystic River, as well as to conduct a conceptual analysis identifying design opportunities. All supporting data gathered in this study is presented in the appendices or cited in the bibliography.

This document is intended to serve as a supplement to the Request For Proposal. Although it is by no means a complete inventory/analysis, it should serve as the initial resource which will introduce the key issues, opportunities and constraints facing the design and development of a comprehensive Mystic River Master Plan.

Overview

This study is comprised of primarily three sections which address: the historical land use and development along the Mystic River, to include the evolution of its recreational network; ecological changes that resulted from such land use; and an analysis of current conditions and design opportunities that should be addressed in a comprehensive master plan. The analysis and opportunities have been graphically documented on a series of maps which are enclosed in the report.

All computer data was produced on the Massachusetts Geographical Information System (GIS), and includes 1985 land use data, protected recreation and openspace land by ownership, wetland and waterway delineation, watershed boundaries, roads, train corridors, and conceptual overlays. The most recent available United States Geological Survey (USGS) maps have also been produced for reference use.

Regional Context and Immediate Study Area

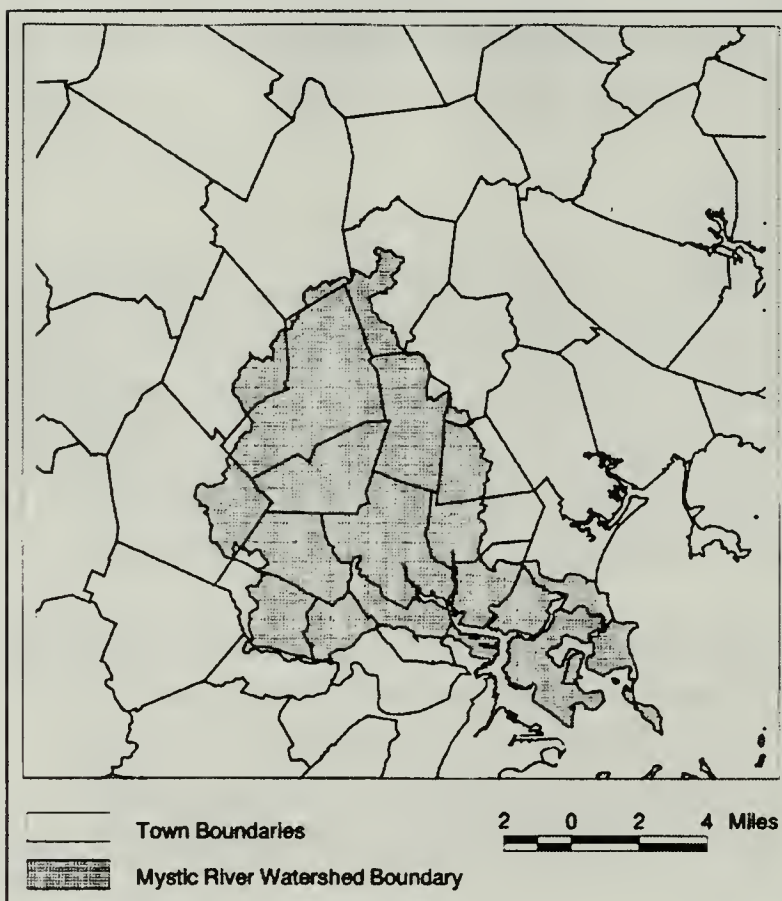
The Mystic River Watershed encompasses approximately 70 square miles within eastern Massachusetts and drains all or parts of the following towns: Everett, Chelsea, Malden, Medford, Melrose, Stoneham, Reading, Woburn, Burlington, Winchester, Arlington, Lexington, Belmont, Somerville, Cambridge, and the Boston neighborhood of Charlestown (see map). It is highly developed and industrialized, and has a population of approximately 500,000. The watershed is

plagued by environmental problems including significant urban runoff, diminished and deteriorating wetlands and habitats, and combined sewer overflows. Between 1980-1988, the Mystic River Watershed underwent the highest percentage of land development of any watershed in Massachusetts.¹

The watershed is made up of a network of four rivers, eleven brooks, one creek, three lakes, thirteen ponds and five reservoirs. Some of the major tributaries which converge to form the Mystic River include the Aberjona River, the Malden River, Island End River, Alewife Brook, Horn Pond Brook, and Mill Brook. Other significant water bodies include the Upper and Lower Mystic Lakes, Spot Pond, and Great Meadows. These

water bodies, in addition to the Mystic River itself, their recreational network, ecological value, and adjacent land uses (past, present, and future) form the context of this study.

The immediate study area, which has been the focus of this project, reaches from the northern boundary of the Town of Winchester, southeast to the Mystic River's release into the Boston Inner Harbor. The study area also includes the Alewife Brook and Malden River tributaries.



Mystic River Watershed

Historical Context

Pre-Colonialism

Before English settlement of the Mystic River Valley in the early 1600's, the area was inhabited by the Pawtucket and Menotomet tribes of the Algonquin Indian nation, whose sustenance derived from the bountiful land and waters of the

Mystic River, its tributaries, ponds, and lakes. The name “Mystic” most likely derived from the Algonquin Indian name for the river. The Indians named it “Missi-Tuk”, with “Tuk” meaning a “river whose waters are driven by waves” (as by tidal action), and “Missi” meaning “great.” Over time, the Pilgrims shortened the pronunciation of “Missi-Tuk” to “Mystick.”²

The Massachusetts Bay Colony received a land grant for most of the Mystic River Watershed in 1628. It included the land now comprising Charlestown, Somerville (which was originally part of Charlestown), Malden, Everett, Melrose, Woburn, Winchester, Stoneham, Burlington, and parts of Medford, Cambridge, Arlington, and Reading.³ Prior to this time the area north of the Mystic had been ruled by Sachem Nanepashemet and (after his death in 1619) by his widow, Squaw Sachem, “Indian Queen of the Mystick” (whose territory stretched to the Connecticut River). Squaw Sachem ruled for thirty years until her death in 1650. Her sons, Montowampate and Wenepoykin, respectively succeeded her, but death by disease, and displacement by the English settlers eventually attrited Native American inhabitation of this area.⁴ The banks of the Mystic River and its supporting water bodies are rich in archeological history of this Indian culture. Many artifacts have been found (particularly along Alewife Brook and the eastern edges of the Mystic Lakes). Descriptive records of these findings are on file with the Massachusetts Historical Commission and the MDC Chief Archaeologist.

Colonial Settlement and Development

The Mystic River estuary and the Neponset River estuary were initially the most important settlement areas of the Massachusetts Bay Colony. The Mystic River was described by its first English explorers as an “uncouth wilderness” notable principally for its “stately timber”. In her historical analysis of the area, Elizabeth Durfee Hengen notes:

“The marshes and meadows were recognized for their agricultural potential, and during the 1640's European settlement took root in the area. As early as 1630, however, development patterns shifted in favor of the Charles River estuary and Boston Harbor, and the Mystic estuary became a secondary center, strong in agriculture and shipbuilding (primarily in Charlestown and Medford).”⁵

The low lying areas of the Mystic River became primarily occupied by manufacturing and processing establishments. As the metropolitan population grew, industrial uses, mining, agriculture, and residential needs intensified along

the river. Like the Charles, its estuaries were filled to add land area, and very little of the river valley's marshland exists in a natural state (see delineation of remaining wetland areas in Appendix A).

Shipbuilding and Trade

Charlestown and Medford were built around port industries which required the construction of bulkheads and piers, as well as dredging of the river channel for navigation. Medford grew as a center for the construction of clipper ships, as well as a center for import and export trade of agricultural products, rum, iron, steel, and gunpowder. It also developed into a supply depot for New Hampshire and Vermont. Most employees lived in the residential area surrounding the trade and industrial center, with the wealthier businessmen living on the hill overlooking Medford Square. Beginning around 1890, waves of immigrants brought many new settlers to the area which began to transform Medford into the primarily residential city that exists today. The Boston and Lowell and Boston and Maine Railroads also helped to speed this transformation by situating a passenger rail station in the town's center, allowing it to become a commuter suburb of Boston.⁶

In addition to housing the seat of government for the Massachusetts Bay Colony which was established in 1635, Charlestown's development also grew around the construction of naval warships. The Charlestown Navy Yard was one of the six original naval shipyards established in 1800-1801. The Charlestown Yard was primarily a repair, outfitting, and supply yard which kept naval vessels ready for duty at sea. It also built more than 200 warships from early 19th century sailing frigates to 20th century steel warships. It manufactured most of the rope used by the Navy in the 19th century, and developed the new die-lock chain making process in the 20th century.⁷ Tailors, rope makers, tile makers, anchor smiths, wheelwrights, and blacksmiths were among the first settlers of the (original) peninsula.

When the area was first settled, only a narrow "neck" of land joined it to what is now Somerville. Charlestown depended on this land "beyond the neck" for its agricultural and dairy products. Settlement patterns throughout these areas followed Medieval English precedent, with house lots granted in town (the Charlestown peninsula), and larger tracts on the mainland (Somerville) for grazing and plowing.⁸

Industrialization

Beginning in the eighteenth century, Somerville began its transformation from primarily agricultural land uses to that of industrial. The existence of large glacial clay deposits in Somerville's soil allowed for extensive excavation for the manufacture of bricks and pottery. Somerville was also known as the "Chicago of New England," for its many meat packing plants and high production of processed meat and food products. Quarrying, food processing and distribution,



Somerville Historical Society, circa 1925. (Zellie, 1990)

auto manufacturing, glassworks, etc., polluted the water and left little if any open space in Somerville along the Mystic River. The owners of Somerville's major factories and firms left few civic improvements, no monuments, and no tracts of land for parks. When the brick industries declined, the excavated land (like the marshes) was filled in for the construction of building lots.⁹

The extensive network of transportation infrastructure (roads, railroads, bridges, and canals) helped facilitate the development of this area and also took up a great deal of open space. The Medford Andover Turnpike (Mystic Street), constructed in 1804, and the Middlesex Canal, constructed in 1803, essentially formed the earliest obstructions to the southern banks of the Mystic River--a tradition carried through to the 20th century with the construction of I-93 in the 1960's.

Similar settlement took place on the north banks of the Mystic River. The land of South Malden (now Everett) lying due north of the “neck” was early to develop due to expedient transportation provided across the Mystic River. “Penny Ferry” connected Sullivan Square in Charlestown with an old Indian trail, renamed “Bow Street,” in Everett. This ferry was a vital military link, carrying soldiers and equipment from the Navy Yard to Malden and points north.¹⁰ Shortly after the Revolutionary War, the Penny Ferry was replaced by the Malden Bridge, a wooden causeway 2400 feet long. Route 99 now serves this historic transportation corridor.

Everett’s initial settlement grew up around agricultural land uses, brick making, and small scale manufacturing. After the Civil War, however, major industrial development soon followed. By 1920, industry had become the main tax base of Everett, earning it the nickname “The Iron City of New England.”¹¹ In the late 19th Century, the population of Everett exploded, primarily due to its proximity to Boston and low tax rates. Between 1870 and 1900, the street car suburb grew from 2,000 to 24,000 residents, and developable land grew scarce.¹² The southwest section of Everett, once 500 acres of tidal salt marsh, was filled for spillover industrial growth, particularly for the storage of oil and petro-chemicals. In 1868, the New England Chemical Company was founded. It served as the precursor to the Monsanto Chemical Works that occupied over 150 acres of this filled salt marsh, and which remained one of the city’s largest industries until the late 1980’s. Other industries (including iron, steel, gas, oil, coke, and energy production) also occupied this land once belonging to the Mystic River.¹³

Middlesex Canal

The Middlesex Canal, begun in 1793 and completed in 1803, is the oldest canal of its size in the United States. It provided a continuous waterway from the Mystic River in Charlestown to the Merrimack River in Lowell. It’s route traversed 27-1/4 miles, 20 locks, eight aqueducts, and forty eight bridges. The canal’s dimensions averaged three feet in depth, 33-1/2 feet in width at the water line (20 feet at the bottom), a 10 foot wide towpath on one side, and a five foot berm on the other. The canal’s principal water source was the Concord River, with Horn Pond in Woburn serving as its auxiliary water source. The Middlesex Canal was constructed “primarily through woodland, wetlands and meadows, which largely characterized the unpopulated terrain between Lowell and Boston in the early 19th century. Commercially, the Middlesex Canal proved to be short-lived. It

reached its peak use between the 1820's-1830's, when it was being used to transport goods from the interior reaches of New Hampshire, via Concord, to the important Boston markets.”¹⁴ After the construction of the Boston and Lowell Railroad in the 1840's, the use and value of the canal and a transportation corridor dwindled. No longer profitable, it terminated operations in 1851. In 1852 “the Canal was filled under its bridges and many of them were removed. Canal property was sold, and in 1859 the courts decreed that the proprietors had ceased to enjoy their rights.”¹⁵

In 1964 the Middlesex Canal Association formed to provide a forum for canal advocates and to “acquire, restore, and preserve all extant remains of the old Middlesex Canal; to establish a museum..., and to establish ...parks for public recreational and/or educational use.” In 1978, the Middlesex Canal Commission was formed for the purpose of “planning for, establishing, laying out, developing, and maintaining a park to be known as the “Middlesex Canal Heritage Park.” In 1980, a feasibility study was conducted to provide a comprehensive inventory of the canal, its location, its condition and nearby significant environmental and development features for each of the nine cities and towns along the 27-mile route. The report also makes recommendations for reuse and preservation of the canal. Excerpts of this report are contained in Appendix B.

Suburbanization

Originally rural communities, Arlington and Winchester began to densify in the 1840's when railroad lines opened the area up to Boston commuters. Electric street cars and the road improvements in the early 20th century accelerated this development. Although suburbanization was not as dense as that along the lower banks of the river, the majority of land use in these areas is residential.

Park Development & The Metropolitan District Commission

The preservation of open space along the banks of the Mystic River and its tributaries can be attributed to the Metropolitan District Commission (MDC). The MDC owns over 90% of the land along the Mystic River between the Amelia Earhart Dam and Winchester's town center, to include both banks of the Alewife Brook (from its confluence with the Mystic River to Little Pond in Belmont). See site analysis and opportunity maps for delineation of MDC-owned land.

Early Acquisitions

The importance of the preservation of openspace along the metropolitan area rivers was recognized in the 1890's when the first plan for the Metropolitan Parks System recommended public control and development of these areas. Charles Elliot, who lead the formation of the Metropolitan Parks Commission (precursor to the MDC) and served as its consultant landscape architect, reviewed the hills, streams, and coasts of the Boston area which he felt should be reserved for public use through metropolitan rather than municipal action. His advocacy for the public acquisition of waterfront land is best explained the following statement:

“It should be specially noted that the public ownership and control of non-commercial strips of land along river banks and seashores is something very different from the public ownership of ordinary ‘parks’. Parks like Franklin Park are valuable, indeed, but riverside and seashore strips provide access to great stores of fresh air and refreshing scenery without removing any large area from the tax lists. They do, indeed, quickly pay for themselves, because practically the whole value of the lands acquired is added to the next adjacent private lands. They, negatively, prevent the depreciation of the potential values of surrounding lands which is so generally caused by ‘cheap building’ on freshwater and tidal shores. They place the control of the trunk lines of surface drainage under public authority, and so forfend the public from such costly expenditures for the prevention of floods as Boston has ben driven to along Stony Brook in Jamaica Plain and Roxbury. Reservations of this class are primarily desirable, not for aesthetic or sentimental, but for eminently practical, reasons; while their first cost is properly regarded as an intelligent investment, rather than an extravagant expenditure.”¹⁶

As soon as the Metropolitan Park Commission was established in 1893, it began delineating boundaries of the five reservations for which it gained authorization. The Middlesex Fells Reservation land was acquired in 1894, and a route was soon selected to connect it with the densely built population center of Boston. The first acquisition of 80 acres of land along the Mystic River was made in 1895.¹⁷ Through citizen gifts and takings, acquisition of other portions of the Mystic River soon followed. “By the end of 1899, the Commissioners reported that practically the entire banks of the Mystic River in Medford had been taken for the use of the public, and that the last takings which lay in Arlington and Somerville would be complete in 1901.”¹⁸

Originally intended to be included in public acquisitions, the western shores of the Mystic Lakes remained under private ownership with the exception of the segment at the southern end of the lower lake, which was secured in 1915.¹⁹ This

lack of public ownership along the lakes was considered “a serious menace to the beauty of the reservation.” Land acquisition along the Mystic below the Fellsway bridge was not considered feasible at the end of the 19th century, as “commerce had too strong a claim upon these shores.”²⁰

Parkways

Many of the visual and spatial characteristics that now exist along the Mystic River can be attributed to the construction of the Mystic Valley Parkway. Opened to the public in September, 1897 (100 years ago this fall), it shaped the use and character of the riverbanks between Winchester’s town center and its juncture with Mystic Avenue in Medford. Over time, this parkway grew not only to be used for “recreational pleasure travel,” but also to serve the needs of residential and commercial uses that intensified along its edges. Segments were added to its lower lengths in the 1940's and 50's, linking it with The Fellsway and Revere Beach Parkway.

During 1907 the Metropolitan Planning Commission acquired land along Alewife Brook for the construction of a parkway to link the Mystic River Parkway with Spy Pond. Although the eventual road layout changed, the original intention of linking the Mystic and Charles Rivers was carried out via the construction of parkways along the Alewife Brook and Fresh Pond.

Because of the unsanitary conditions of the Upper Mystic River and its tributaries, plans were developed during that same year to acquire land for the “purification” of Alewife Brook in accordance with an agreement between the cities of Cambridge, Somerville, Arlington, and Belmont. Plans for purification included draining the large marsh areas around the Alewife Brook, as well as channelizing the brook. By 1912, all excavation work for the brook’s channel was completed, and the parkway was opened to traffic in 1916.²¹ Detailed accounts of the development of the Alewife and Mystic Valley Parkways can be found in the sources listed in the enclosed bibliography.

Over the next forty years, the growth in population, commerce, and traffic provoked significant engineering improvements of the parkways (i.e. traffic circles, road construction and reconstruction, etc.). As mentioned before, the lower segment of the Mystic Valley Parkway (connecting Mystic Avenue to the Fellsway) was completed in the 1940's. Another segment was added in the 1950's



Photo of Mystic River conditions after grading of I-93, (Charles A. Maguire & Associates, 1966)

to take traffic off Mystic Avenue and provide a continuous right of way along the southern bank. After the Second World War, recreational needs also intensified during this time as open space within local communities decreased and leisure time increased. Explosive postwar growth of the suburbs also increased pressure on the development of new highways and interstates that could serve commuter needs. The construction of I-93 along the Mystic River in the early to mid 1960's is evidence of the high value placed on suburban ideals over urban form and environmental integrity.

Recreation

Despite public ownership of most of the Mystic riverfront, very little land had been developed for recreational use. Unlike the Charles River which was dammed early in the 20th century, the Mystic remained tidal until the mid 1960's, and largely undeveloped for recreational use until the late 1970's. Up until that time, the only active recreation area developed within the upper reservation was at Sandy Beach, with passive recreation being served by the wooded areas surrounding the Mystic Lakes and minimal facilities and landscaping between the lakes and Medford Center. The only landscaped area below Medford Center had been the Chelsea Naval Hospital.²²

Two large infrastructural projects were responsible for totally reshaping the lower Mystic River basin in the mid-1960's. The construction of I-93 resulted in the dredging and extensive realignment of the lower river channel (i.e., straightening the meanders, filling the marshes, and creating a larger water basin area). The

Mystic River Elevation Control Project also resulted in the construction of the Amelia Earhart Dam, allowing for a consistent elevation within a new fresh water basin.

Intensive studies were conducted in the late 1960's to evaluate and plan for the recreational potential of this old, yet new metropolitan open space. In 1966 the MDC had a preliminary master plan prepared for the future development of the shoreline above the dam which resulted in the Mystic River Reservation. The project area included MDC property along the river from the Amelia Earhart Dam to the Mystic Valley Parkway's Harvard Street Bridge.



Segment of the original master plan of the Mystic River Reservation (Carol R. Johnson & Associates, 1974)

Designed by Carol R. Johnson & Associates, the Mystic River Reservation was completed in the early 1980's. The design and development of this 200 acre site addressed the need for soil reclamation resulting from the extensive draining and hydraulic filling of the original tidal marshes and realignment of the river channel. It transformed a barren landscape into a continuous greenspace, with bike and pedestrian trails, conservation areas, parking areas, and active recreational facilities. The original intent of the plan was to link the Mystic Lakes with uninterrupted access to the Boston Harbor. However, a few key segments of riverside property were never fully developed, and these segments continue to inhibit linkage to what could be a larger openspace network. Specific site conditions will be addressed later in this study.



Earlier design proposal for Amelia Earhart Dam. (MAPC, MDC, DNR, 1969)



Earlier design proposal for Medford Square. (MAPC, MDC, DNR, 1969)

Past Planning Proposals

In 1969, a cooperative study of the Mystic River (as well as the Charles and Neponset) was completed by the Metropolitan Area Planning Council (MAPC), Metropolitan District Commission (MDC), and the Department of Natural Resources (DNR). The study proposed a visionary open space acquisition and development program in order to maximize the full recreational potential of the Mystic River, and also addressed the needs of pollution abatement, conservation of wetlands, and targeted key areas for acquisition and easement. Although the study's recommended open space program was quite extensive, its major proposals are summarized below.

The open space program included public acquisition, protection, and recreational development of the rest of the Mystic River and its associated streams, ponds, and wetlands. The intent of this extensive acquisition allowed for a continuous park system from the Boston Harbor to the river's headwaters above Route 128.

In addition to the development of the Mystic River Reservation (which had just begun), high priority open space acquisition and recreational development included waterfront land in Charlestown, Everett, and Chelsea (particularly along the Island End River and to the east of the Chelsea Naval Hospital grounds). Land to the east and west of the new access road for the Amelia Earhart Dam was also recommended for acquisition, with development of recreational facilities along the Malden River, and public use of the new dam as a educational attraction and pedestrian crossing. Pedestrian and bike access was also recommended along the river to and from the Wellington "T" station.

Urban redesign of Medford Square's riverfront was also recommended in order to create a vibrant town center that embraced the water and provided continuous access. One of the two "Metropolitan Athletic Centers" (MAC) was planned to be

located near the Wellington Bridge. This MAC was to accomodate high school interscholastic and extracurricular sports in facilities which were characteristically too expensive for individual communities to construct.

Continuous bike and pedestrian trails were recommended along both sides of the Mystic River. The Mystic Lakes were recommended to remain “natural” in character, although an intensive public recreational area, including an outdoor theatre, swimming and boating facilities, etc., was proposed for construction on the Isthmus separating the two lakes. The Alewife Brook was also recommended for high priority recreational development.²³

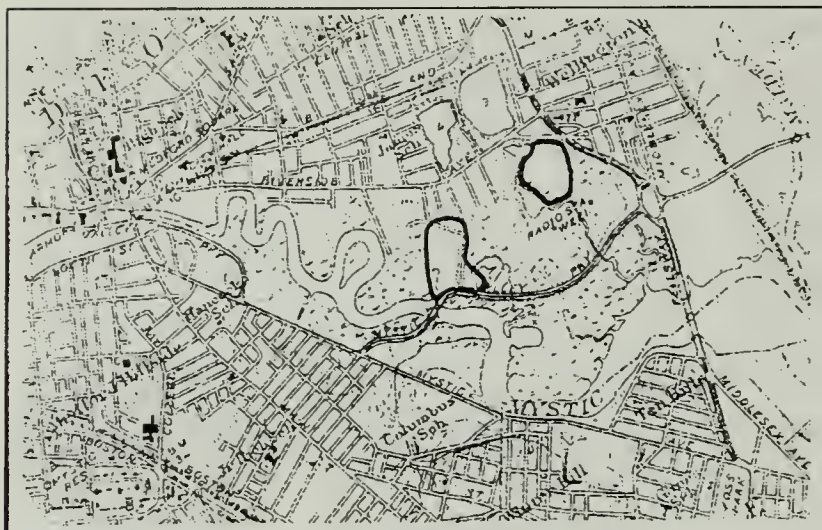
Aside from the design and development of the Mystic River Reservation, few of these insightful and far reaching proposals have been implemented to date. However, some additional land has been acquired, and many of the issues discussed in the study have recently been re-examined by local communities and the MDC (these issues will be discussed in detail later in this study).

Ecological Context

All of the land uses within the towns bordering the Mystic River and its tributaries have had a significant impact on water quality and hydrologic characteristics. In addition to the aforementioned filling of extensive salt marshes, realignment and dredging of the river channel, dam construction, and heavy industrial development/pollution near the mouth of the Mystic River and its lower tributaries, the upper basin also contributed its share of ecological alteration and degradation.

Early Degradation

In 1864, a 40 foot wide dam was constructed between the upper and lower Mystic ponds to separate the fresh water from the tidal salt water in order to provide a drinking water source for the towns of Somerville and Charlestown. This dam not only raised the water level of the Upper Mystic Pond six feet, but it also altered the natural ecosystem of this water body.



1946 USGS Map of Mystic River. Dark lines indicate fill. (Carol R. Johnson & Associates, 1974)



1956 air photo of Mystic River before construction of I-93. Dark lines indicate fill. (Carol R. Johnson & Associates, 1974)



Early 1960's air photo of Mystic River during construction of I-93. Notice drastic realignment of river channel. Dark lines indicate fill. (Carol R. Johnson & Associates, 1974)

As early as 1870 a special report was conducted to study the pollution of the streams, water supply, and sewage of the towns located in the Mystic (as well as the Charles and Blackstone) river valleys, with resulting recommendations for the construction of sewers in the Mystic Basin. In 1886 another sanitary survey of the Upper Mystic Lake reported that it was "very foul and stinking badly."²⁴ In the 1890's, pollution of the Aberjona River turned the Upper Mystic Lake a dark brown color from the chemical, gelatin, dye, and tanning industries upstream. Consequently, the lake was no longer used as a water supply reservoir and recreation in the lake was prohibited. Many of these Aberjona River industries remained in operation until after World War I.

After feasibility studies began in 1931, the Amelia Earhart Dam was constructed in 1966 to regulate the water level of the Mystic River and prevent harbor pollution from moving upstream with the tides. This action also changed the water of the river from brackish to

fresh water, consequently altering the ecosystem of the riparian plants and aquatic organisms which inhabited the Mystic and its tidal tributaries. Although the dam may have prevented pollution from traveling upstream, the water quality of the Mystic River, its tributaries, and lakes remained poor because of the continued influx of fecal coliform bacteria from a significant number of combined sewer overflow pipes, as well as degradation from other point and non-point source nutrients and metals. This pollution, as well as physical impediment of the dam, caused the degradation of aquatic habitats on which fish (such as alewives and bluebacked herrings) depended upon to spawn. Once these fish began to disappear in the late 19th Century, birds such as the heron and bittern followed suit. The river herring run will be discussed in more detail later in this study.

Advocacy

In the late 1960's and early 1970's, community interest in the ecological degradation and recreational opportunities of the Mystic River began to increase. As mentioned before, the cooperative planning study conducted by the MAPC, MDC, and the DNR publicly addressed the need for pollution abatement of the metropolitan rivers.

In 1971 the Mystic River Watershed Association, a grass-roots, volunteer citizens organization, was established for the purpose of protecting and improving the natural environment of the Mystic River watershed. These citizens were concerned with the poor water quality of the Mystic River and unified to advocate a watershed-based approach to public and private policy-making. Other special interest groups formed (such as the Alewife/Mystic River Advocates and Friends of the Mystic River) to supplement the advocacy of ecologically conscious management, preservation, education, and development of the watershed. Today many federal, state, regional, and local public and private organizations work to support this goal. A more detailed discussion of their actions are addressed later in this study.

Water Quality Issues

In 1981, Camp Dresser & McKee, Inc. conducted a "Comprehensive Hydrology Study" for the Mystic River watershed in order to evaluate flood potential and water quality within the basin. The study found water quality (particularly that of

the Aberjona River, Alewife Brook, and the Mystic River), to have consistently been in violation of the “Class B” waterway pollution control standards for which they were so designated.²⁵ A “Class B” rating is the minimal quality required to enable water contact sports, water acceptable for human consumption (with treatment), and water which would have excellent aesthetic and wildlife habitat value.²⁶

Most all test sites exceeded acceptable limits of fecal coliform bacteria which is discharged into the waterways through combined sewer overflow (CSO) pipes. In the older Boston communities (particularly within the Mystic River watershed), storm water and sewage travel in the same conduits to the sewage treatment facility at Deer Island. These conduits have only a limited capacity. After a certain amount of rain, when capacity is reached, excess flow consisting of both sewage and stormwater is released directly into the local waterways in order to avoid back-ups into people’s homes.²⁷

As a result of legal action initiated by public and private concern over Boston Harbor’s failure to meet state and federal clean water laws, the Massachusetts Water Resources Authority (MWRA) was created in 1985 to modernize water and sewer services. The MWRA was also charged with spearheading the cleanup of the harbor, the Charles River, Mystic River, and Chelsea Creek. The Boston Harbor Project includes new primary and secondary sewage treatment plants to be built according to a court-mandated schedule, along with a 9.5 mile, 24-foot diameter tunnel that will discharge treated effluent into Massachusetts Bay. Since 1986, the MWRA has been conducting water quality testing of stormwater discharge to monitor pollutants and other physical/biological qualities in order to determine the appropriate corrective action. Aside from the construction of new treatment plants, other major capital expenditures are often required to remedy CSO problems (i.e., upgrades of old treatment plants, construction of new collection conduits, etc.). The final phase of the project began this year and will be completed by 2008. This work is expected to reduce CSO volume by 84 percent over 1988 conditions (when the first phase began), and also provide screening and disinfection for 96 percent of the remaining flow.

Most of the contributing CSO pollution enters the Mystic River via the Alewife Brook. No legal CSO’s exist in the watershed above the Alewife Brook or within the Town of Arlington. Recent testing by the MWRA shows that fecal coliform bacteria levels are highest where the Alewife meets the Mystic River. Coliform concentrations decrease as the water volume within the lower basin increases (due

to dilution and higher retention times). MWRA standards for Class B water quality are (on the average) met during dry weather conditions, but exceeded during wet weather.



Alewife Brook Junction with Mystic River: CSO's contribute to poor water quality in this area.

Other public and private organizations have been formed which monitor water quality, as well as encourage community support for the protection and restoration of the rivers. Through the Riverways Program, the EOEA organizes "Shoreline Surveys" to build river constituencies to

gather data on the river's condition. This data is then used to devise an action plan. An action plan prioritizes short and long term projects that the group agrees to undertake, and also identifies appropriate agencies to report problems to. The Riverways Program, in conjunction with the MRWA, Alewife/Mystic River Advocates, and Friends of the Mystic River recently completed a Shoreline Survey of the Mystic. A copy will be on file with the MDC after the report is published.

Save the Harbor/Save the Bay (SHSB) is a private, non-profit group that was founded in 1986 to "foster a positive vision of Boston Harbor and the Massachusetts Bay and to build a broad-based constituency to promote their restoration and protection."²⁸ Just this past spring, SHSB organized its own volunteer monitoring program through its "Storm Drain Detective Project." The project was developed largely in response to the MWRA's CSO plan and associated studies, for which the SHSB advocates high quality mitigation. In conjunction with the Alewife/Mystic River Advocates, it conducted water quality testing of the Alewife Brook and the Mystic River. Results from spring samples determined that three out of the four drains surveyed had abnormally/excessively high levels of either fecal coliform, oil/grease, or copper (see results in Appendix C). Since both the Riverways Program and SHSB strive to encourage

community-level environmental advocacy and action, they often work together to ensure efficient implementation.

Supporting Analyses

Although an ecological analysis of the Mystic River was not conducted for the purpose of this study, relative information is available from other sources. *The Mystic River Shoreline Management Plan*, completed in June of this year by the Halvorson Company, Inc., identifies maintenance issues for the Mystic River shoreline.²⁹ An “Ecological Management Plan” prepared by Geizentanner Associates forms the backbone of these recommendations. The management area runs from the outlet of the Mystic Lakes to the MBTA Orange Line bridge. The ecological inventory focuses on the habitats of the area--the riverbanks, wetlands, forests, meadows, and recreational land. Primary wildlife and plant communities are inventoried, and management recommendations are made to enhance the ecological value of this land. A copy of this report is on file with the MDC, and an excerpt of “management issues and recommendations” is included in Appendix D.

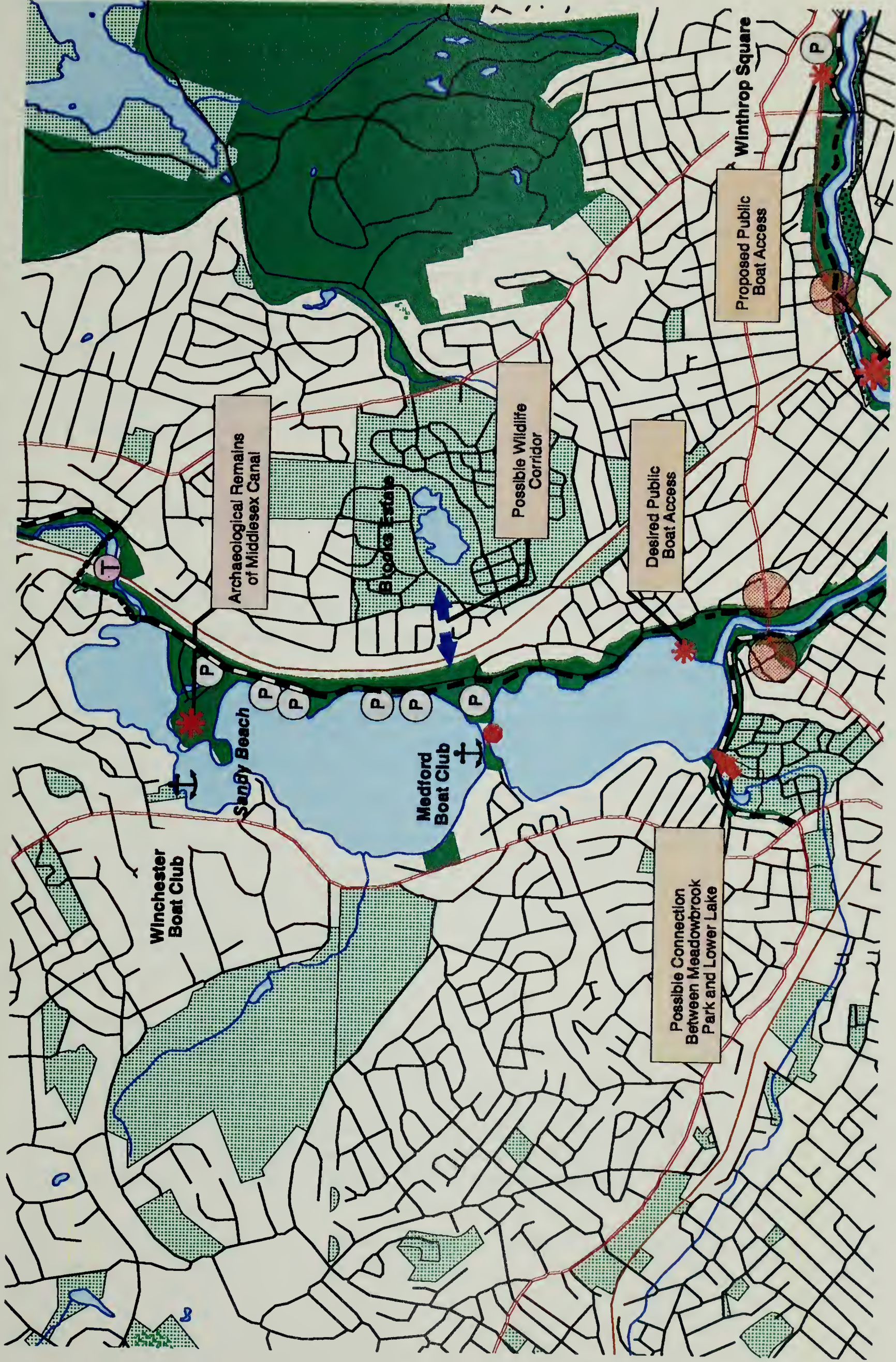
The Alewife Ecology Guide, a 1994 publication of the Mystic River Watershed Association, is a wonderful reference which describes the flora and fauna of the Alewife Brook, as well as habitat requirements and stewardship recommendations.³⁰ Much of the information contained in the Alewife Ecology Guide is applicable to the Mystic River and its tributaries, and specific recommendations can easily be translated into ecological landscape design guidelines. Excerpts from this book are included in Appendix E.

Work is currently being conducted by Tufts University and MIT to study the historical chemical contamination of the Aberjona River and Mystic Lakes (particularly the concentration and migration effects of arsenic and chromium). Started in the mid 1980's as part of the National Institute of Environmental Health Science's case study, the Aberjona Watershed has been extensively researched to understand the effects of environmental chemicals on human health. Information regarding chemical composition and concentrations found in stream/lake beds may prove useful to dredge/fill or land use decisions. Summaries of these reports will soon be made available on the Tufts University website.

A thorough study of the Mystic River Herring Run has recently been completed

Mystic Lakes District: Bacon Street
Bridge to Medford Street Bridge

0.5 0 0.5 Miles



by Tufts University students for the Alewife/Mystic River Advocates. This study, *Fish in the City*, investigates the causes for the decline of River Herring (Alewife and Blueback Herring), their spawning requirements, physical and biological barriers to spawning, and reasons/recommendations for reintroducing River Herring to the Upper Mystic Lake and its tributaries. This report also identifies the water quality implications of current land uses and developments along the Mystic River. A copy of this report is included in Appendix F.

In addition to the resources mentioned above, the GIS maps included in the following section identify areas of particular ecological value and/or concern.

Site Analysis and Opportunities

Winchester Town Center: Aberjona River and Horn Pond Brook Confluence to Bacon Street Bridge

Analysis: The physical character of the Mystic River varies greatly along its 12.5 mile length. The headwaters of the Aberjona River and Horn Pond Brook converge in Winchester, forming the focal point around which the community has been built. Wedge Pond, Judkins Pond, and the banks of the river itself are highly maintained in this area and form the stately setting for Winchester's commercial center and public open space. The Aberjona River corridor and park system also provides the town with an extensive open space network. The system was originally planned by landscape architect Herbert J. Kellaway, a former associate of Frederick Law Olmstead, during the early 1900's. The continuity of the Aberjona and Horn Pond Brook corridors has been disrupted over the years by loss of certain links in some areas.

Opportunities: The Town of Winchester recently had a Master Plan for their "Triangle Area" completed. The Triangle Area is the most diverse neighborhood of Winchester and includes some old industrial sites, housing developments, businesses, the primary commercial and institutional nodes, and most importantly, the town's two riverway open space systems (the Aberjona River and Horn Pond Brook). Winchester feels that both riverways are underutilized and inaccessible in certain parts, and offer great potential for recreational development.

The Mystic River

Site Analysis and Opportunities

Legend

Roads



Unpaved



Secondary



Interchange



State Route



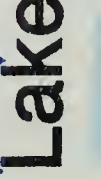
US & Interstate



Trains



Rivers & Streams



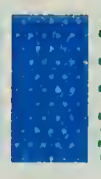
Lakes & Ponds



Water (Lake, Pond, River)



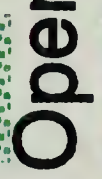
Ocean, Reservoir)



Flats & Shoals



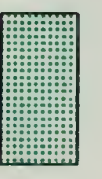
Wetlands



Openspace by Ownership



MDC



NON-MDC OPENSOURCE



No Public Access



Redevelopment Area



Encroachments



Developed Pathway



Proposed Pathway



Desired Pathway



Dangerous Traffic Area



Parking Area



MBTA Station



Special Interest Area

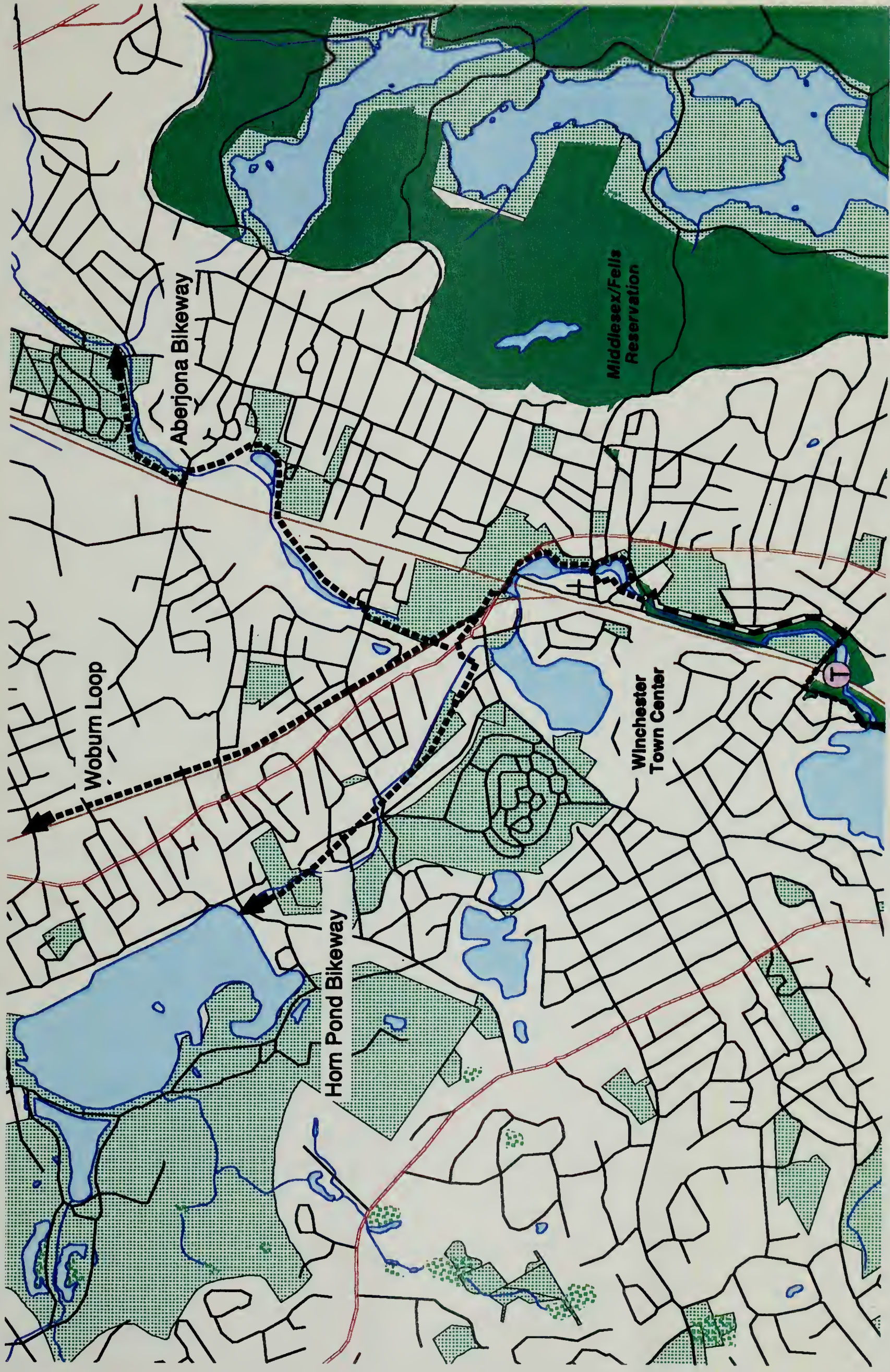


Boat Access



Fish Spawning Impediment

**Winchester Town Center: Aberjona
River and Horn Pond Brook
Confluence to Bacon Street Bridge**



Winchester's Greenway Initiative proposes detailed plans for the restoration and expansion of the historic Aberjona and Horn Pond Brook bikeways. Along with Woburn and Stoneham, Winchester has also made plans on developing a third open space corridor termed the "Tri-Community Bikeway," or "Woburn Loop." The Woburn Loop is an abandoned rail corridor/right-of-way that travels through these three towns, and plans have been made to transform this corridor into a pedestrian/bike trail.

All three corridors meet in the vicinity of the Lake Street/North Main Street/Skillings Road intersection before they converge and travel south along the Aberjona. Improvements to the Aberjona Bikeway are intended to link this juncture with the Mystic Lakes, expanding and enhancing the current Mystic River openspace network. ISTEAs funding has been authorized for the Tri-Community Bikeway, and DEM/ISTEA grants have already been secured for the Aberjona and Horn Pond Brook Greenway improvements.

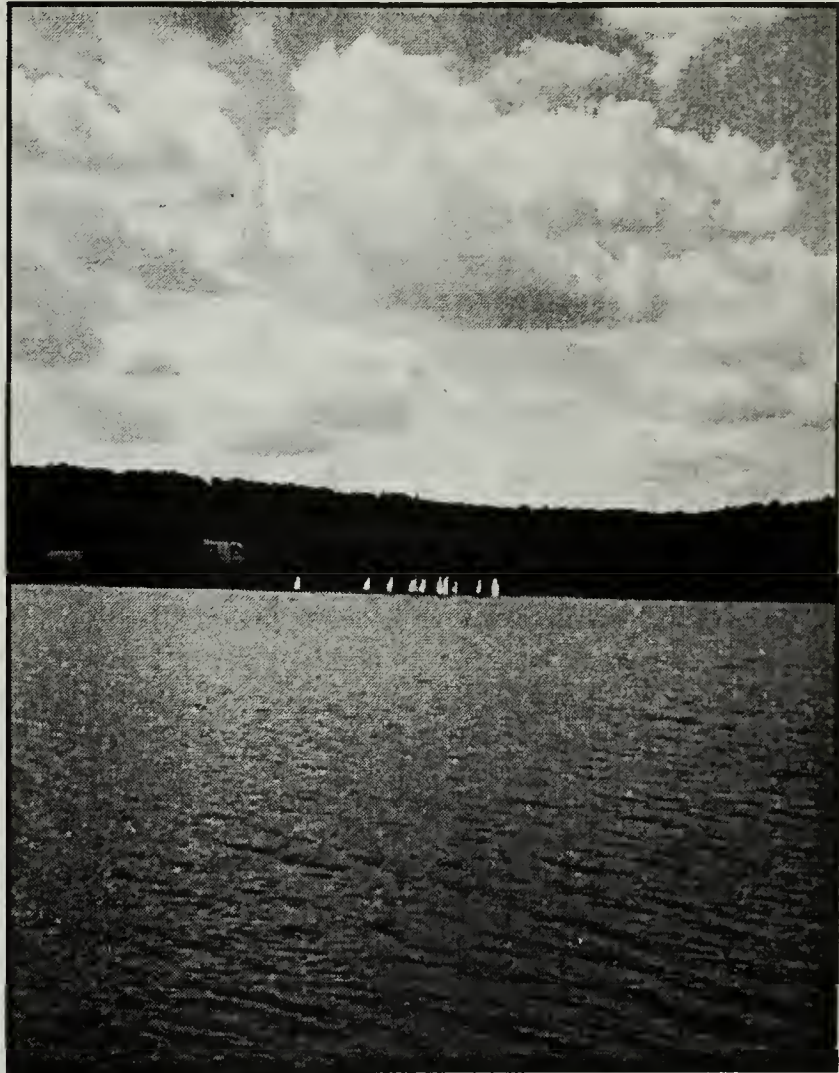
The Middlesex Canal also passed along Horn Pond Brook, and Horn Pond itself served as its supplementary water source. The Heritage Park Feasibility Study recommends many interpretive sites along this corridor.

Mystic Lakes District: Bacon Street Bridge to Medford Street Bridge

Analysis: South of the Bacon Street Bridge, the Aberjona flows into the Mystic Lakes. The Lakes provide over 200 surface acres of open water and support a variety of water-based recreational uses. The physical character of this district is primarily that of the natural, wooded environment interspersed with low density residential neighborhoods. Forested and grassy slopes form a buffer around these lakes on both the eastern and southern edges. Foot and bike paths along the Lakes and up to Winchester's town center are discontinuous, and many supplementary paths have been worn by intensive use.

The Mystic Valley Parkway provides a second layer of edging along these eastern and southern sections, and serves as the boundary between public and private (residential) space along the Lower Lake. Many nice views to the Lakes are possible from this Parkway which provides access to the Middlesex Fells Reservation.

The western and northern edges have been privately developed with large residences and do not allow for public access. The only segment of public land on the western edge is the "Window-on-the-Mystic," which is a three acre wooded parcel owned by the Arlington Conservation Commission. The Medford Boat Club is situated on the dam that serves as the isthmus between the Upper and Lower Mystic Lakes. Chain link fencing prohibits public access through this area. The parking areas at the dam are unpaved and unkempt, allowing for soil erosion and poor aesthetic appeal.



Sailing on the Upper Mystic Lake



Mystic Valley Parkway Restoration at Upper Mystic Lake

Sandy Beach is an MDC recreation area located on the eastern side of the Upper Mystic Lake which provides facilities for picnicking and freshwater swimming. Renovation of the picnic and parking areas, as well as a segment of the Mystic Valley Parkway and adjacent pathways between Sandy Beach and the Bacon Street Bridge, was completed last year. Archaeological remains of the Middlesex

Canal have also been found in the Sandy Beach area.

Opportunities: Although there are many opportunities for water-related recreation at the Mystic Lakes, public boat access is limited. Only private and semi-private access is available to the Lakes by way of private residences on the north and west coasts, the Winchester Boat Club and Tufts University Boathouse on the Upper Lake, and the Medford Boat Club on the isthmus. A launch area near the Tufts University Boathouse serves small, non-powered, public boat access to the Upper Mystic Lake. Opportunities exist to enhance this non-powered boat access area, as well as provide public motorboat access/parking and picnic areas to the Lower Mystic Lake. Rehabilitation of the parking area east of the dam is also needed. Possibility for joint funding of this project with the Medford Boat Club should be investigated.



View of old Middlesex Canal bed at Sandy Beach

Aside from the Middlesex Fells Reservation, there are a few other smaller, yet significant conservation areas near the Mystic Lakes. The Brooks Estate is a private conservation area located to the east of the Upper Mystic Lake, north of Oak Grove Cemetery in Medford. Meadowbrook Park is a 17 acre parcel located adjacent to the

Mt. Pleasant Cemetery south of the Lower Mystic Lake. Owned by the Town of Arlington, it serves the delta of Mill Brook and is mostly wetland habitat. Although no formal connections exist between these parcels, the Mystic Lakes, or the Middlesex Fells Reservation, each provide significant patches of wildlife habitat. The ecological and/or recreational value of these areas could increase if adequate connectivity were established.

Since intensive urbanization followed the closure of the Middlesex Canal, most all of the original structures within its lower reaches have been obliterated. Remains found at Sandy Beach represent the most identifiable segment found in

these lower reaches. In 1996, the MDC conducted an archaeological reconnaissance of the Sandy Beach area in Winchester and found significant components still surviving. This segment was determined to be a significant historic landscape and archaeological site, and the MDC has discussed including it as an Addendum to the listing with the Massachusetts Historical Commission (MHC). According to the MDC's Chief Archaeologist, the MHC "recommended that a new listing be prepared to include the entire 27-1/4 mile length of the canal, regardless of extant remains, or the lack thereof." Work is currently underway by the Middlesex Canal Commission to secure funding for preparation of a new Nomination, as well as for the restoration of the canal segment at Sandy Beach. A copy of the Restoration and Cultural Resource Management Plan for the Sandy Beach segment is on file at the MDC.

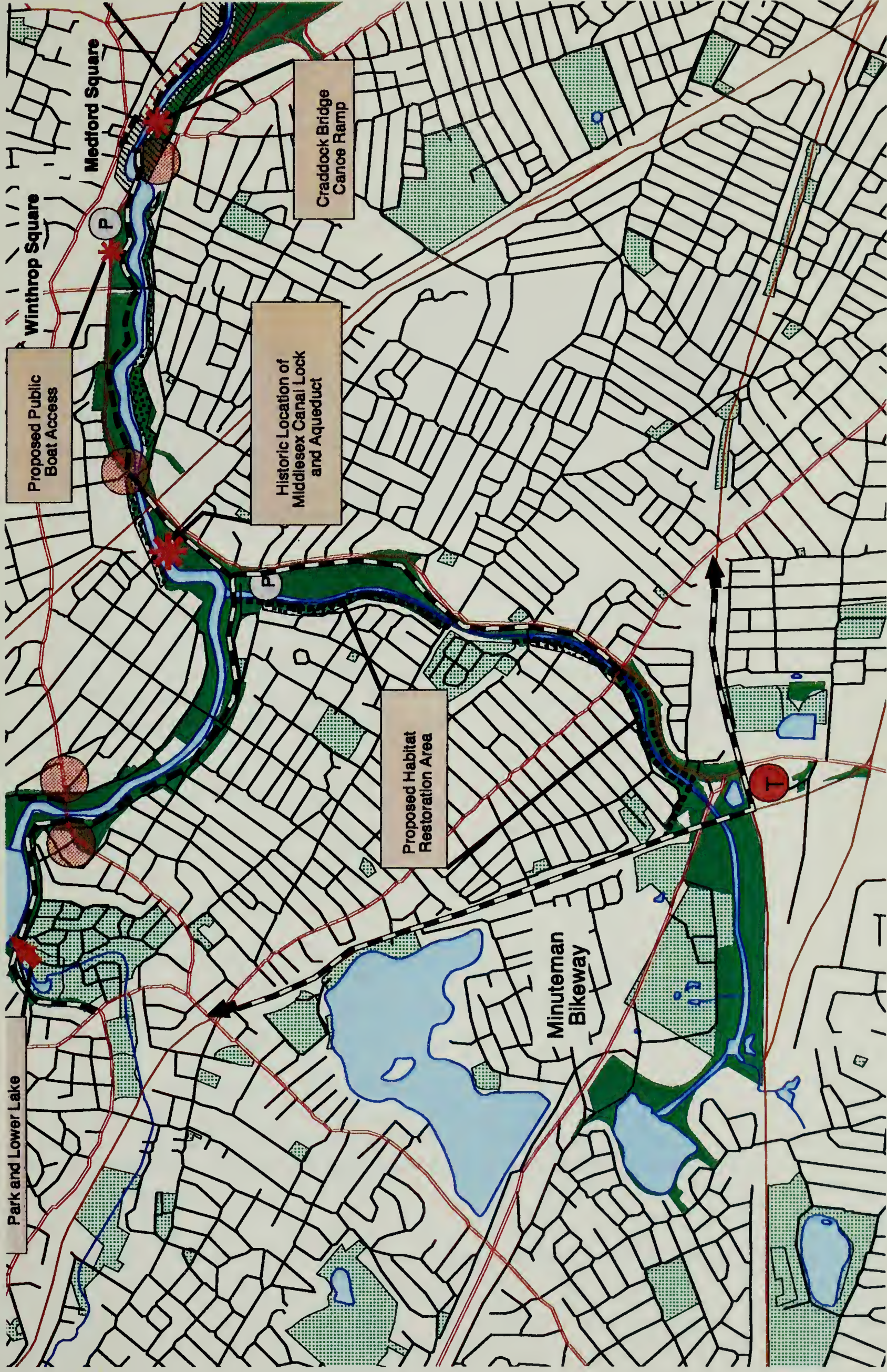
Since the historic route of the Middlesex Canal appears to traverse along and/or across MDC property in at least four locations (i.e. the Sandy Beach Area as discussed above; along and across the Mystic Valley Parkway on the east side of the Upper Mystic Lake; across the Mystic River near the Boston Avenue Bridge in West Medford (where an aqueduct and Gilson's Lock were located); and along I-93 in Somerville), there is an opportunity to incorporate it into the Mystic River's master plan through restoration and/or marking. Further investigation of the Middlesex Canal Commission's quest to develop the Heritage Park is highly recommended (see Appendix B).

Alewife/Mystic Juncture: Medford Street Bridge to Auburn Street Bridge

Analysis: MDC property along this segment of the river is very narrow, as is the river itself. Aside from Dugger Park (which is owned by Medford), there are no active recreational facilities. There are questions of encroachment in this area, particularly along the west bank of the Mystic River to the east and west of the Harvard Avenue Bridge. Land use along this segment of the river is almost entirely residential, with the exception of the Alewife Brook Parkway rotary and the large commercial center on the south side of the Auburn Street Bridge.

This segment is aesthetically pleasing, and tranquil in character. Since the north bank is not heavily traveled, it seems to reflect the private character of the surrounding homes. The river itself is very picturesque and the banks of the river

**Alewife/Mystic Juncture, Alewife
Tributary, and Winthrop Square:
Medford Street Bridge to I-93 On/
Off Ramp**



are densely vegetated in most areas. As recorded in a 1996 site analysis by Brown & Rowe, Inc. "people often remark that this section of the Mystic River reminds them of the Charles River Basin."



The Upper Mystic River is tranquil in character



Below the juncture of Alewife Brook, the river widens and open space become constricted, particularly near the crossing of the Auburn Street Bridge. Developed pathways in this segment are somewhat discontinuous and spatial connections between the Alewife Brook and Mystic River (which could be important as a wildlife, as well as pedestrian corridor) appear to cater to the automobile. All types of thru traffic are redirected to the north bank at the Auburn Street Bridge by way of land use, road hierarchy, and residential encroachments to the east.

Opportunities: Because of the pastoral and tranquil character of this segment, opportunities exist to enhance the passive recreational framework which already exists. Bike and pedestrian trails, seating and picnic areas, signage requirements, etc., have already been proposed by the Brown and Rowe study for the area east of the Alewife juncture. Developed pathways to the west could connect this segment to the Mystic Lakes.

Although a thorough traffic study of the Mystic Valley Parkway is recommended, dangerous intersections (particularly the two rotaries on Medford/High Street and the intersection at the Auburn Street Bridge) could be mitigated by improved signage and road markings.

According to the Middlesex Canal Heritage Park Feasibility Study, the Boston Avenue Bridge was constructed over the original canal route. Cultural and historical interpretation opportunities exist, and as discussed in the previous segment, this historical resource may be incorporated into a larger cultural interpretation trail.

Alewife Brook Tributary:

Analysis: In 1996, the Alewife Brook was intensively studied by Brown & Rowe, Inc. for the purpose of providing the MDC with a master plan that would strengthen the character of the parkway, conserve wetland, and help meet recreational needs of the surrounding communities. Their analysis of site conditions within the Alewife corridor is summarized below.

“The Alewife Brook extends above ground from the Alewife “T” Station to its confluence with the Mystic River, and is contained within an open concrete culvert for about one-and-a-half miles. From the intersection of Broadway and the Alewife Brook Parkway, the brook flows out of the culvert along gently sloping banks overgrown with wetland trees and shrubs. The brook parallels the parkway from its intersection with Route 2 to the junction with the Mystic Valley Parkway, about a one-mile distance. Although the Alewife Brook is the park corridor’s dominant natural feature, many people are unaware of its existence because of the dense overgrowth and the culvert’s recessed, ditch-like nature.

On the parkway’s brook side in Cambridge and Arlington, open space is quite generous, averaging about 300 feet. A three-foot wide paved pathway parallels the parkway between Massachusetts Avenue and the rotary at the confluence of the Alewife Brook and the Mystic River. Dilboy Field, an MDC recreational facility which includes a small stadium, playing fields, parking lot, and tot lot, is located between Broadway and the Mystic Valley Parkway.

Located adjacent to the MDC park land are two important community and regional recreational resources--Thorndike Field and the Minuteman Bikeway. The Town of Arlington owns and maintains Thorndike Field, which consists of three soccer fields, informal basketball courts, and play equipment. The Minuteman Bikeway, a ten-foot wide asphalt path, is a rails-to-trails conversion which connects Bedford, Lexington, and Arlington to the Alewife T Station. This bike path is within a few minutes walk of the Alewife Brook.”³¹

The only redevelopment proposal along the Alewife Brook is the construction of a hotel along the north side of Massachusetts Avenue in Arlington. The East Arlington Good Neighbor Committee has been working to advocate environmental mitigation of this development.

Investigation of encroachment areas was recently conducted and survey reports are on file with the MDC.

Opportunities: As mentioned above, the Brown and Rowe study recommended short and long term improvements to the Alewife Brook and Mystic Valley Parkways. Most short term recommendations include the installation of new granite curbing and historic street lights along the parkway, the removal of chain link fencing and selective vegetation, improved signage, and additional landscaping. Long term recommendations primarily include the development of a continuous bike/pedestrian pathway, connection to the Minuteman Bikeway, restoration of the brook and adjacent wetlands, renovation of Dilboy Field facilities, and improved traffic circulation along the Parkway. A copy of this report is provided in Appendix G, and vellum copies of the master plan drawings (1"=20') are on file at the MDC planning office.

Marking or interpretive signage of significant pre-historic archeological remains could also be incorporated into the master plan. There are 13 pre-historic sites recorded along the Mystic River, Mystic Lakes, and Alewife Brook. All segments of the project area which have not been extensively modified should be considered archaeologically sensitive, and all land development concerning such pre-historic sites requires compliance with the MDC's Cultural Resource Management Program.

Winthrop Square District: Auburn Street Bridge to I-93 On/Off Ramp

Analysis: This segment of the river accommodates public access only on its north side. Both the Condon Shell (a small bandshell structure), three athletic fields, and a poorly maintained parking lot occupy the riverfront south of the Mystic Valley Parkway. Residential uses again form the primary backdrop to this openspace. Pathways are undeveloped in some areas, and pedestrian traffic seems to be primarily served by the neighborhood sidewalks on the north side of the Parkway.

The land on the south side of the riverfront is also residential. However, no public road serves to formally divide this residential property from the private backyards that abut this corridor, and encroachments to MDC property abound. A worn

foot trail is present along this segment which shows evidence of use (although seemingly infrequent), and vegetation is dense along the river banks.

Like the segment to the east, the river is aesthetically pleasing (although not very visible from the Parkway for most of its distance). In a physical survey conducted by Brown and Rowe, a small stream with an old fish ladder was found in this area, although this tributary has been culverted under the Parkway.



Example of encroachments on south bank of Mystic River

Bike and pedestrian crossing of the Parkway at the off ramp to I-93 is difficult, and there is little room on this and the Auburn Street Bridge for non-vehicular traffic.

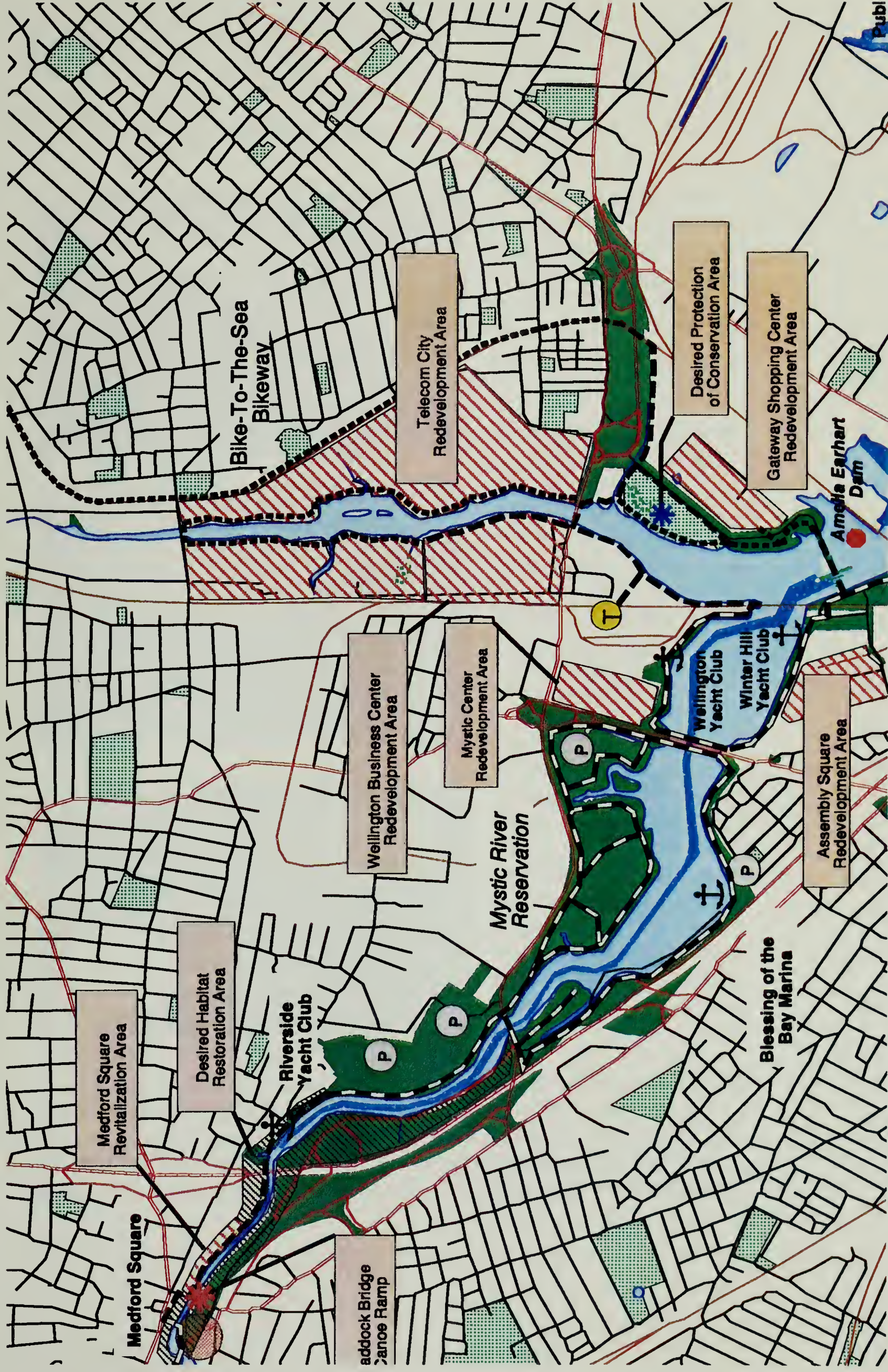
Opportunities: In addition to the aforementioned short and long term recommendations made by Brown and Rowe, specific recommendations of this area include the restoration of the existing parking lot and athletic fields, as well as the installation of a canoe launch near the parking area. Encroachments along the southern bank would have to be mitigated before a pathway could be formally developed in this area.

The I-93 On/Off ramp intersection is hazardous to pedestrian crossing in this area and traffic studies are recommended to improve this condition.

Medford Square District: I-93 On/Off Ramp to General Lawrence Bridge

Analysis: Although rich in Medford's trade and shipbuilding history, this segment of the riverfront has the least amount of accessible public open space. Aside from the small parcel of land west of Craddock Bridge, there is no public

Medford Square, Lower Basin, and
Malden Tributary: I-93 On/Off
Ramp to Amelia Earhart Dam





Medford Square foot bridge and historic buildings



Craddock Bridge



Public access to the waterfront in Medford Square is inhibited by a chain link fence

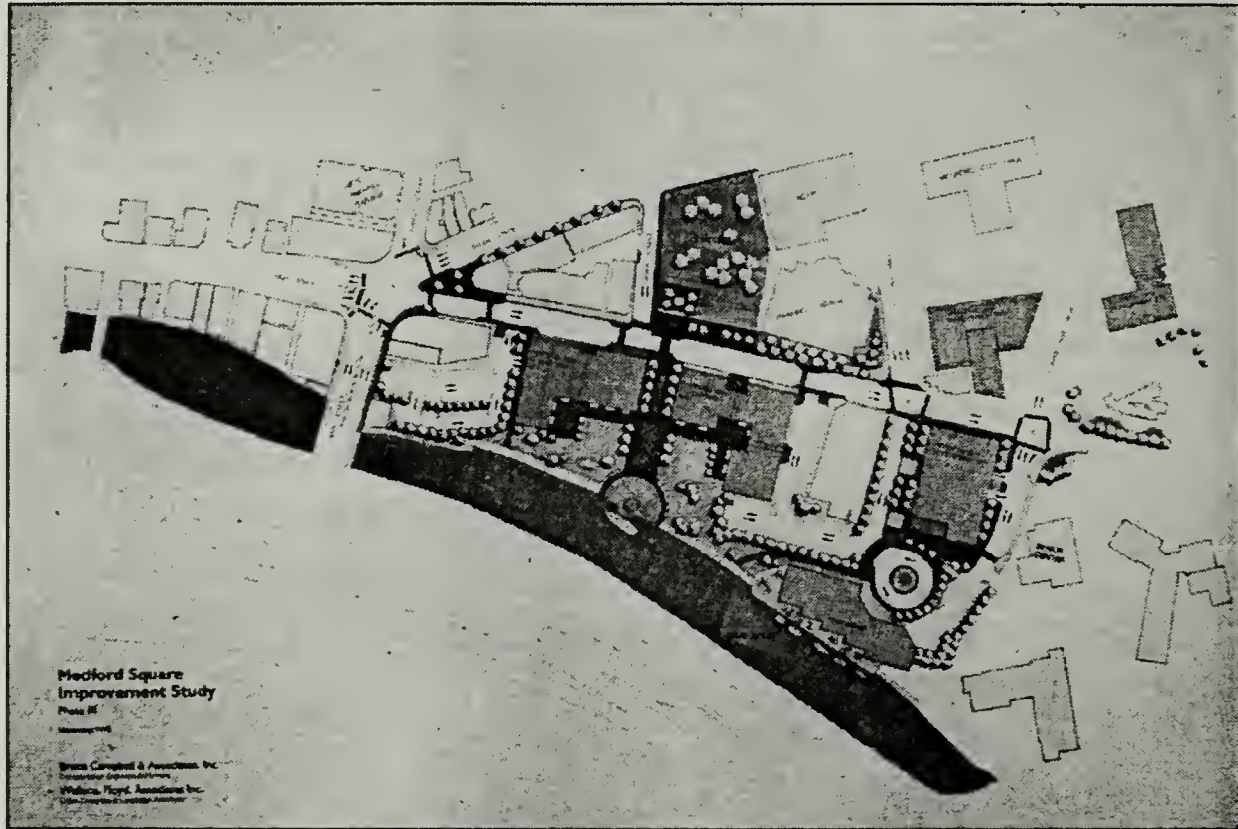
access along the southern side. I-93 is the dominant landscape feature here, and it is quite visible from Medford Square. The only way to cross I -93 in this segment is by way of the Craddock Street Bridge underpass.

On the northern side (to the west of Craddock Bridge), historic buildings, representing Medford's shipbuilding days, abut the water's edge. Although these buildings may be in need of structural repair/remodeling, they provide a great deal of visual interest and character to the riverfront.

The Medford Square foot bridge links this district to the recreational areas mentioned above. Although no longer in service, the Craddock Bridge Dam once limited the extent of tidal surges upstream. An old canoe ramp still exists at this bridge which allowed canoeists to pass the dam without having to open the locks.

The commercial district to the east of Craddock Bridge (along the northern edge) allows public access along the river, although a chain link fence separates the sidewalk from the water's edge. Old pilings along the riverbank (which can only be seen from the water) are all that remains of the historic commercial ship docking that once was so prevalent in Medford Square. A loop road separates the

river from the parking lots and the rear of commercial buildings that front on Riverside Avenue. The aesthetic appeal of the riverfront in this area is poor.



Medford Square Improvement Study, (Bruce Campbell & Associates, 1990)

Historically the commercial and trade center for the town, no public open or green space was ever formally developed in this area. Rise in automobile use transformed this area into a paved parking lot in the 1950's-60's. In the late 60's, studies were conducted to propose urban design and recreational improvements along this segment, linking it with the Mystic River Reservation to the east. This plan was never realized, and another urban design improvement study was conducted in 1990 which readdressed the same issues. Although the riverfront parking lot was pushed back to allow construction of the current road and sidewalk, this master plan has also not yet been realized.

On the northern side, pedestrian access from the Mystic River Reservation is terminated at the Riverside Yacht Club. No signs are posted to inform people that public riverfront access resumes at Craddock Bridge. Both bike and pedestrian travel through this area is disorienting and user unfriendly.

An apartment complex has been constructed in between the Riverside Yacht Club

and the Mystic River Reservation. Although riverfront access exists along this parcel, no formal pathway has been developed. Private uses seem to dominate the character of this segment.

The Mystic River Reservation begins to the east of the apartment complex. There are many active recreational facilities in this area, including Hormel Stadium (which provides for football, rugby, and track), and a few other athletic fields/courts. An iceskating facility (Loconte Rink) is also located in this area. Pathways are well developed, and an undercarriage allows for easy bike/pedestrian crossing of the Parkway bridge, north/south as well as east/west over the General Lawrence Bridge. The river begins to widen along this segment, and I-93 starts to lose dominance as the water sheet becomes the primary feature in the landscape.

The Mystic Valley Parkway passes over the river and under I-93 at Harvard Street. Vehicular signage is poor in this area and the I-93 juncture adds to the confusion. There is also no signage to inform pedestrians or bikers that a pathway begins on the south side of the river (east of the bridge).

Opportunities: Since this segment does not allow for public waterfront access along most of its length, opportunities certainly exist to provide connection to and from the openspace networks to its east and west. The Medford Square Foot Bridge provides access to the interior of Medford's commercial and retail center. Short term improvements could consist of signage directing pedestrians or bikers through the town and onward to the Mystic River Reservation. Long term improvements may consist of working with the Town of Medford to facilitate their urban design improvement plan which would create a commercial and retail node that embraces the river and provides for pedestrian connections. Other long term recommendations may include the development of bike and pedestrian trails on the south bank abutting I-93 (similar to that found in the lower river segment).

Water transportation and recreation could also be expanded in this area. Water taxi access to Medford Center would provide alternate transportation to the Mystic River Reservation, Wellington Station, and downtown Boston. The Craddock Bridge, dam, and canoe ramp, as well as the old buildings abutting the river, could be incorporated into a larger cultural/historic interpretation trail along the Mystic River.

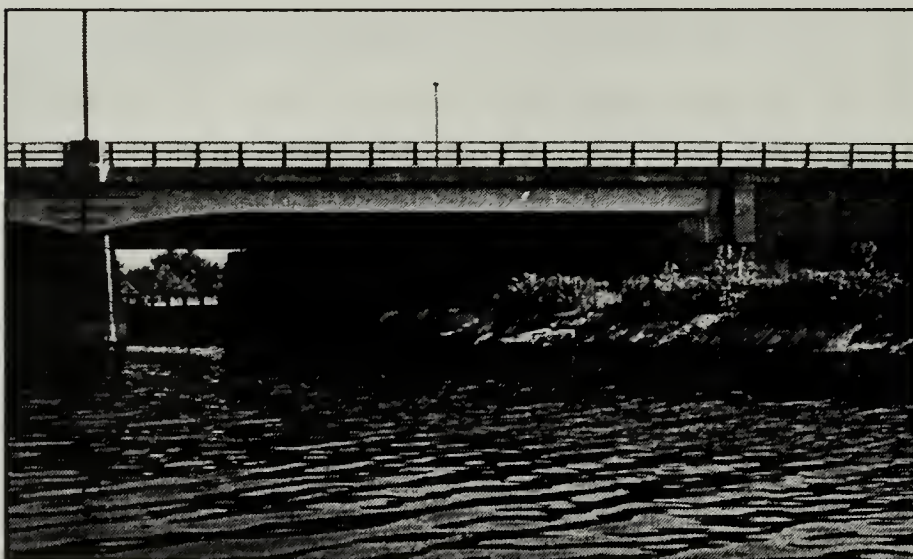
Lower Basin: General Lawrence Bridge to Amelia Earhart Dam

Analysis: This segment of the river is perhaps the most diverse in land use, although it is principally characterized by the restored landscape of the Mystic River Reservation. The wide expanse of upland and wetland vegetation on the north bank disguises the fact that this land was created from



Mystic River Reservation, wetland restoration

hydraulic fill and lay barren only 30 years ago. Passive recreation is served by a network of paved and unpaved bike and pedestrian trails, open fields, and picnic areas which are separated by sculpted earthen mounds and mature vegetation. Conservation areas and restored wetlands also add to the ecological value of the area and provide protected openspace in an urbanized environment. Views to the river are controlled by the topography and vegetation, although ample opportunities exist. Most of the park is well maintained, although a few areas appear overgrown (possible safety hazards) and water quality/aesthetics may be questioned along the inlet to the MDC Police Boathouse.



Undercarriage at the General Lawrence Bridge

As mentioned above, pedestrian and bike access to the rest of the reservation is facilitated by direct trail connections to the south and west (over and under the General Lawrence Bridge) via ramps to the undercarriage. Aside from the small

peninsula, land area on the south side is confined to a narrow strip. The pathway below I-93 is paved and connects to the MDC Blessing of the Bay Boathouse. This boathouse was vacant for many years and just recently began rental programs for canoes and sailboats, as well as in-line skating.. The boathouse is managed and operated by the Boys and Girls Clubs of Middlesex County, and provides the only public boat rental facility along the Mystic River.

Trails continue along Shore Drive, connecting the boat house with walkways along the Wellington Bridge and the northern shore of the reservation. The neighborhood of Ten Hills provides the only adjacent residential land use along this segment of the river, and serves as a picturesque backdrop for views from the opposite shore.

Access to the southern banks of the Mystic River from the inner communities of Somerville is very limited. Access points exist via the Fellsway (southbound) and Shore Drive. Public parking is limited to the area around the boathouse and the commercial center at Assembly Square.

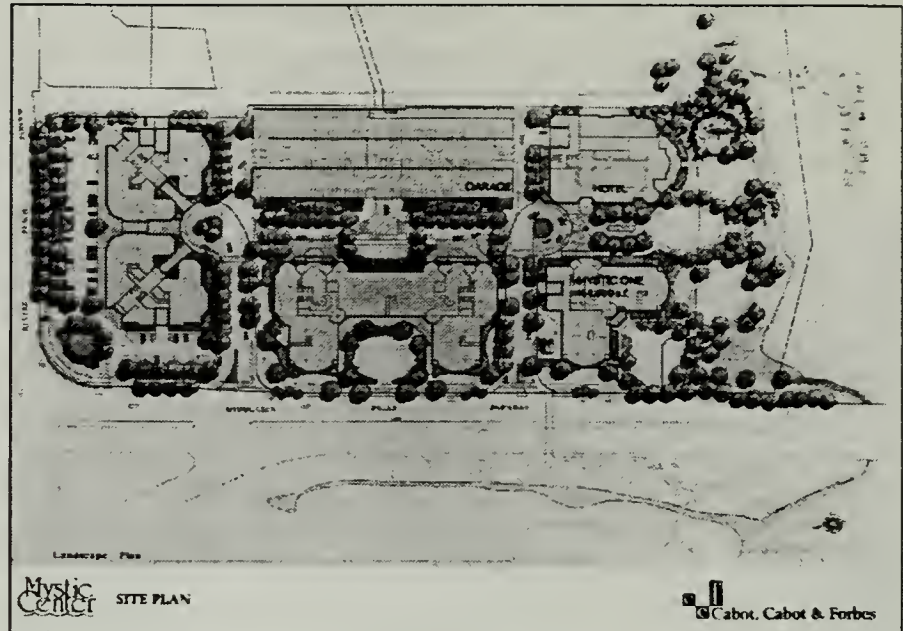
Assembly Square is a large commercial district which originally housed the Ford Motor Company's assembly plant from 1926 to 1958. In the 1980's the site was rehabilitated as a shopping mall, and the complex is currently undergoing redevelopment plans once again. A Super Stop & Shop is planned for the underutilized land to the east of the mall, although legal actions and soil remediation must first be completed. A riverfront pathway forms the northern edge of Assembly Square, passing behind the Winter Hill Yacht Club and linking the Wellington Bridge with Draw Seven Park to the east.

Although pedestrian and bike connections are served by separate north/south right-of-ways along both sides of the Wellington Bridge, east/west connections are poor on both ends. As a consequence, the Wellington Bridge serves as the primary inhibitor to continuous travel along the riverbanks in this segment. Undercarriages were planned as part of the original Mystic River Reservation master plan, but never implemented.

A commercial district, Mystic Center, is currently being developed on the north bank, east of the Fellsway. Mystic Center is a 16 acre mixed use development which is planned to have several office buildings, a hotel, a large parking garage connected to Wellington Station via an elevated shuttle, and an undercarriage beneath the Wellington Bridge to allow for safe and direct connection to the

Mystic River Reservation.

At the present time, one office building, "Mystic One," and the parking garage have been constructed. The developer also funded traffic improvements at Wellington Circle, and provided for the design and redevelopment of the landscape along the Mystic River between the east side of the



Master plan of Mystic Center, (Cabot, Cabot & Forbes)

Wellington Bridge and the Wellington Yacht Club. Improved pathways now connect this segment with an unimproved undercarriage that travels below the Orange Line Bridge. This unimproved pathway terminates on the west side of the Malden River. It was originally planned to provide a pedestrian/bike connection between the Wellington Station parking lot and the rest of the Mystic River Reservation's trail network (the only current pedestrian connection from the river to Wellington Station exists through Mystic Center's elevated shuttle). Although the pathway has not yet been developed, the land is graded to allow for future improvements.

The Malden River serves as the terminus to the recreational network along the Mystic River. From the Mystic River's juncture with the Malden, eastward to the harbor, the riverbanks have traditionally belonged to heavy industry. The Monsanto Chemical Company occupied the land above the Amelia Earhart Dam until the late 1980's when it closed. The site has since been cleared, and soil remediation for this area is ongoing for future redevelopment. Construction of the Gateway Shopping Center (Rosen Associates) is planned for this site, with the stipulation that a park will be developed along the riverfront to connect with MDC openspace along the dam which has recently been restored (see Appendix H). A parcel of land between the Malden River and the Amelia Earhart Dam's access road remains as vegetated conservation land. The MDC has an easement for a pathway to be developed along the Malden Riverfront, linking it to the adjacent MDC and Gateway openspace along the Mystic River. The City of Everett has also expressed the desire for educational/recreational facilities in this area, such as a waterfront park, fishing piers, and an exhibit at the Amelia Earhart Dam.

Opportunities: This segment is certainly the most dynamic in terms of proposed land use changes, and offers opportunity to incorporate openspace and conservation areas into these new development areas and expand the current openspace network.

The town of Somerville is now attempting to have the south bank undercarriage constructed under the Wellington Bridge to link Shore Drive/Ten Hills area and Assembly Square. Central Transportation Planning Staff (CTPS) has been hired to conduct a feasibility study, and funding for the project has been authorized. The broader intent of access improvements to the Assembly Square area is to link it with Sullivan Square in Charlestown via an eastern extension to the waterfront Mystic River bike/pedestrian path. Likewise, if the north bank undercarriage was constructed, it would facilitate access between the land of the Mystic River Reservation with the MDC land to the east, linking it with the Malden River.

The Amelia Earhart Dam's fish ladders are currently inoperable and renovation/redesign is needed to ensure spawning is facilitated. As previously discussed, the Dam was considered for educational exhibits and pedestrian access after it was first constructed. Opportunity for such uses still exists.



Amelia Earhart Dam

A portion of the Monsanto conservation parcel is planned for continued preservation of wetland and wildlife habitat, while the upland portion is planned as parkland with a pedestrian and bike trail. The southern access point of this trail will connect with the Bike-to-the-Sea Bikeway to the west and the northern access point will connect with the Route 16 bridge and Telecom City to the north.

Malden River Tributary:

Analysis: Although specific site conditions along the Malden River were not addressed in this study, there are certain land uses within the area that are relevant to the Mystic River's openspace network. In addition to the grading and easement provisions mentioned above, additional provisions have been made to facilitate future public access along segments of the Malden River. Development of the Wellington Business Center (western bank above the Route 16 bridge) is committed to providing public access through Chapter 91 requirements. Also, an MDC easement exists along the riverfront directly to the north of the Wellington Business Center site.



Architect's rendering of Telecom City, (Malden Redevelopment Authority, 1996)

Telecom City is a proposed development that will involve the remaining 200 acres of land along both banks of the upper Malden River south of Medford Street. Telecom City is a planned technology campus that will include telecommunications, office, research, and manufacturing facilities. The Mystic Valley Development Commission, which includes the towns of Medford, Malden, and Everett, hired the Malden Redevelopment Authority to provide a master plan

for this site which is expected to be completed by late October 97. Piatt Associates has been contracted for the site design.

Since the MDC does not own any land along the Malden River, there are concerns for the long-term guarantee of continuous and accessible openspace along the waterfront, as well as linkage to the broader Mystic River openspace and recreational network. There are also concerns over the implications of increased traffic volume on the Mystic Valley and Revere Beach Parkways, and at Wellington and Santill Circles.

Action is currently being initiated by both the Malden Redevelopment Authority and the Alewife/Mystic River Advocates to address these concerns to the MDC and other public agencies.

Opportunities: Since the MDC does not own land along the Malden River, all opportunities to ensure continued public access must be investigated and acted upon by the appropriate authorities.

Linkage to the planned Telecom City openspace network from the south should be considered, particularly from the Amelia Earhart Dam access road, as well as from the existing Mystic River pathway to the west. Direct connection to the Wellington Station parking lot could also be established to link both river pathways, serving to facilitate commuters seeking alternative transportation.

Bike-to-the-Sea, Inc. is a non-profit organization that has been promoting the concept of a trail to provide safe and convenient access from the Everett-Malden area to the sea. The Saugus Railroad Branch has been targeted as the preferred corridor, which would link the town of Everett with the coastal area of Lynn, (see map in Appendix I).

The Saugus Branch is owned by the MBTA and leased to the Boston & Maine Railroad to provide freight service. The B&M reports that its trains runs about two or three times a month to the vicinity of the Malden-Revere line. From there to the end of the line (where the Saugus Branch joins the main line at Lynn) there is no rail activity. A joint rail and trail use will be necessary on the portion of the line that is still active. The entire right of way is about 9.4 miles and only about 25% of the total track would have to be moved to provide room for a joint right of way.

Bike-to-the-Sea is proposing that the trail begin south of the Revere Beach Parkway in order to access the Gateway Mall via the railroad underpass. It is hoped that this trail will also link the Malden riverfront of the Monsanto conservation area and Telecom City. Bike-to-the-Sea also hopes that the developers will work with the MDC and MBTA to make a connection from the Saugus Branch to Route 99 and the MBTA's Wellington Station in order to access the broader public transportation system. Links to the Mystic River bike and pedestrian path can also be made at this location.

Tidal Basin: Amelia Earhart Dam to Boston Inner Harbor

Analysis: At the Amelia Earhart Dam, the river assumes a strong industrial character. Although the MDC Draw Seven Park abuts the dam and provides open green space as far as the MBTA commuter rail bridge, its surrounding industrial context reminds one of the river's working history. Ongoing soil contamination problems at Draw Seven Park continue to serve as physical reminders of the area's past industrial use. The smell of the air and water also lends evidence to this surrounding context. Now tidal, the Mystic River's elevation fluctuates daily (the monthly extreme averages approximately ten feet).



Industry occupies most of the land within the tidal basin

The most dominant feature in the tidal basin is the Boston Edison Electric Plant. Its smokestacks and prominent position on Everett's riverfront allow it to become the focal point of the region. Petroleum storage containers occupy the northern banks of the river from

Tidal Basin: Amelia Earhart Dam to Boston Inner Harbor



Boston Edison Plant to the harbor. The MBTA bus yard and shipping facilities occupy land on the southern bank from the Draw Seven Park to the Charlestown Port Facility. The M.J. Tobin Memorial Bridge is also a dominant feature in the landscape and signifies the Mystic's release into Boston's Inner Harbor.

The MDC's Mary O'Malley Park provides the only recreational greenspace in this district. Views from this park are extensive and provide insight into the river's working waterfront operations in Everett and Charlestown. However, this park is isolated from the rest of the recreational network along the Mystic, and is only accessible from within Chelsea. Although the park could be accessible by boat, no dock or launch facilities exist. A public marina does exist at the head of the Island End River.

Opportunities: As mentioned earlier, Somerville has proposed linking the terminus of the pathway at Draw Seven Park with Sullivan Square in Charlestown. The majority of the waterfront land in this area is owned by MBTA and serves as the bus depot and storage yard. Although this plan is still in its



MBTA bus depot south of the Draw Seven Park

infancy stage, it would provide an essential link in the Mystic River's open space network that could extend to the Boston Harbor.

As part of the Central Artery/Tunnel project, the Boston Transportation Department has just recently begun to look at opportunities for improving Charlestown's Rutherford Avenue corridor. Rutherford Avenue connects Sullivan Square with City Square, two important transportation and commercial nodes within Charlestown. The current condition of this corridor is quite poor (both functionally and aesthetically). Studies have recently begun to examine ways to improve this corridor, and bike/pedestrian improvements are being considered. This corridor is significant to the Mystic River for two reasons.

First, because Charlestown's waterfront is still a working waterfront, it is unlikely that any recreational use or access will be available along its riverbanks. Any improvements that could be made in Charlestown to link Sullivan Square (which is relatively close to the Mystic River) with City Square, would provide a necessary bike/pedestrian link between the Mystic River and Boston Harbor.

Secondly, the New Charles River Basin Master Plan includes improvements to access the City Square area from the Lower Charles River. As mentioned above, Somerville has expressed interest in linking the Mystic River pathway (that currently terminates at Draw Seven Park) with Sullivan Square. If such action were taken, this corridor could theoretically link the Mystic and Charles River openspace networks (to include connections with the Freedom Trail).

Although the Rutherford Avenue corridor is formally being examined for bike/pedestrian improvements, it is important to note that other opportunities (which would serve the same connections) exist along alternative corridors (i.e. Medford Street). Opportunity to enhance this corridor for bike/pedestrian connections should be explored, as Medford Street is contiguous to five small parks and a high school. Medford Street also connects with Chelsea Street which would provide access to the Charlestown Navy Yard, surrounding marinas, City Square and the Freedom Trail.

Public boat access (such as a water taxi stop) should also be considered at the Mary O'Malley Park Pier, as it could provide the neighboring residents with fast commuter access to downtown Boston and the surrounding areas.

General Ecological Design Opportunities

Since the public has shown great interest in the ecological value and water quality of the Mystic River and its tributaries, the master plan should consider ways to facilitate different types of community volunteer action (i.e. culvert marker/identification, boat access for water quality testing, etc.). Other than the key conservation/restoration areas already mentioned, other priority sites should be identified through a thorough ecological analysis. Other possibilities for enhancing or creating wildlife corridors should also be explored.

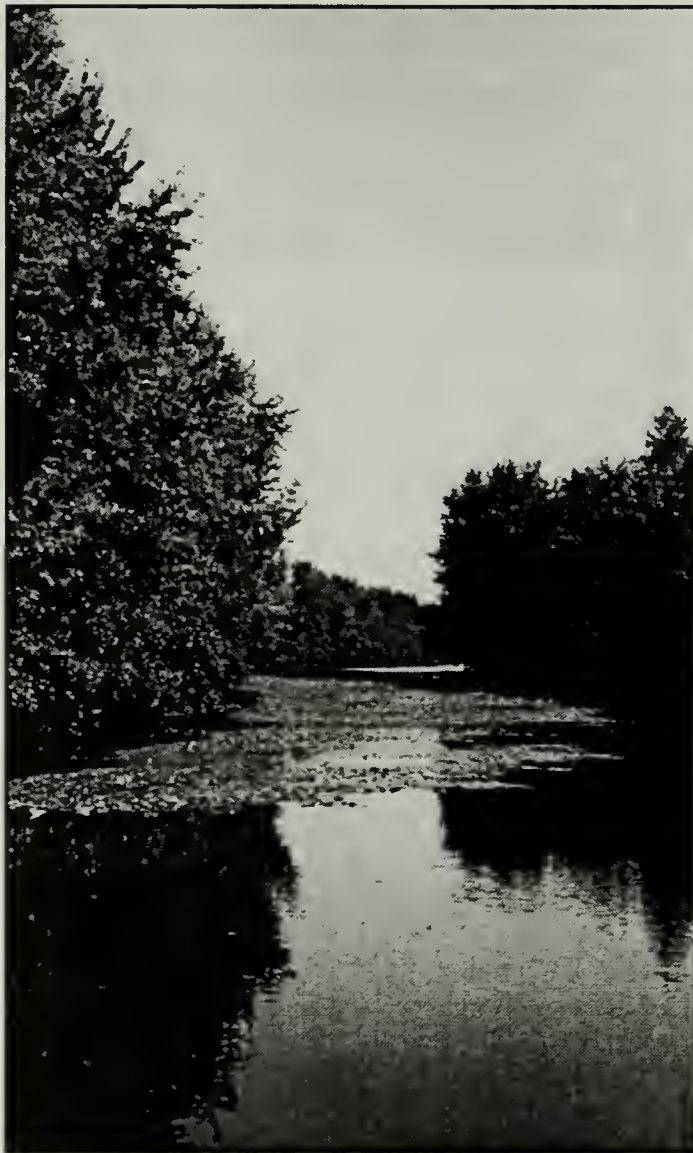
Possibilities also exist to supplement a historic/cultural interpretive trail with natural history markers (i.e., original shoreline/marshland of the Mystic River,

sub-watershed boundaries, wildlife viewing areas, spawning area signage, etc.)

Management of land along the Mystic River should address not only the recreational needs of the surrounding communities, but also the ecological needs of the riparian landscape. It is recommended that the Mystic River Shoreline Management Plan be used as a baseline document for detailed design considerations.

Acknowledgments

Many thanks to the individuals and organizations who provided me with much of the information contained within this report:



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Jodi Sugarman, Policy Director, Save the Harbor, Save the Bay

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11. Hengen, 31-32.
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13. Hengen, 32-37.
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Appendix A

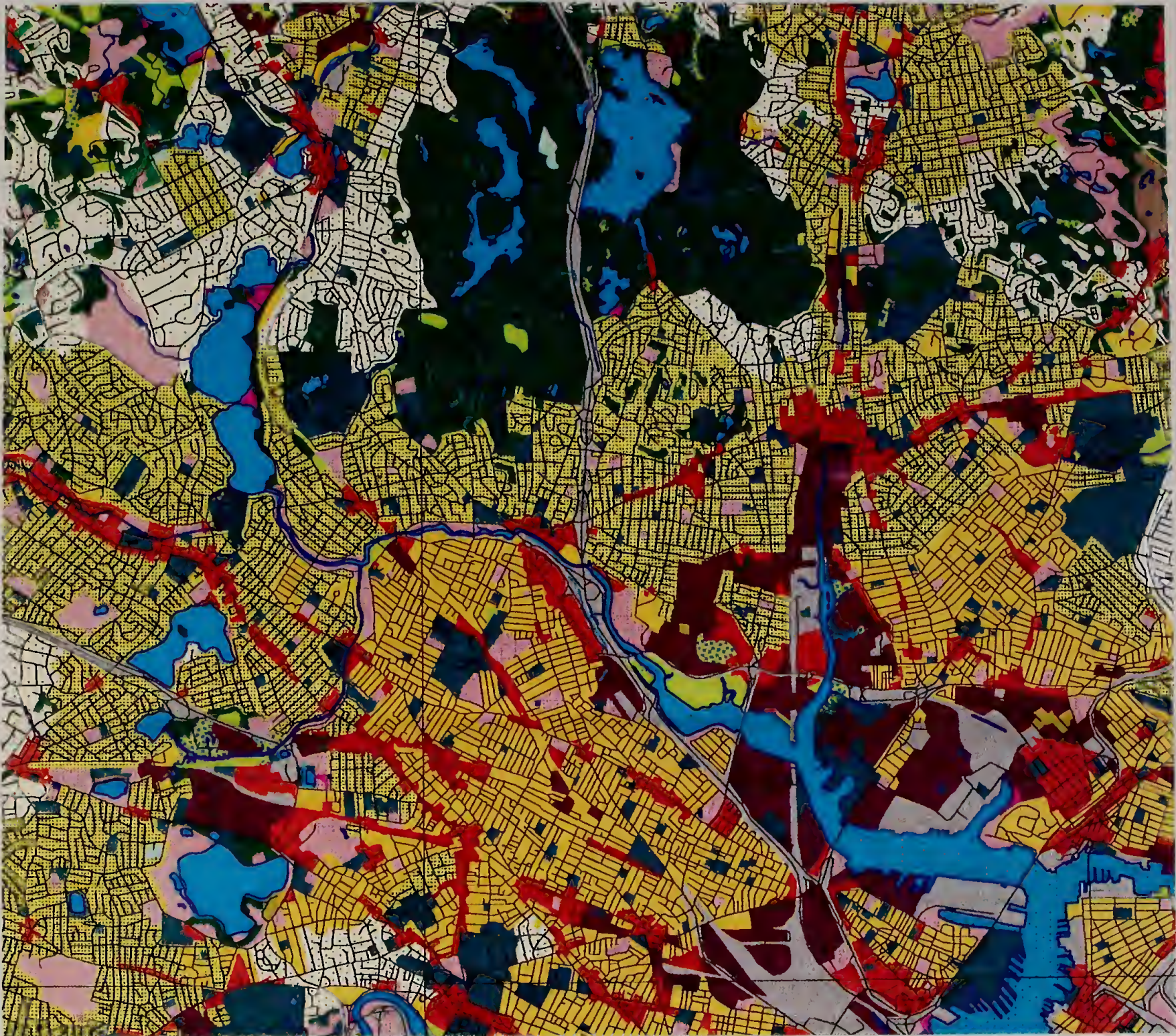
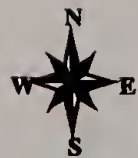
GIS Maps:

Land use within the study area (1: 56,000)

Protected open and recreation space within the study area (1: 56,000)

USGS map segments of study area (1: 21,500)

The Mystic River: Landuse



- Roads
- Rivers & Streams
- Lakes & Ponds
- Water (Lake, Pond, River)
- Ocean, Reservoir
- Flets & Shoals
- Wetlands
- Streams (5k)
- Land Use
- Crop Land
- Pasture
- Forest
- Non-Forested Wetland
- Mining
- Open Land
- Participation Rec.
- Spectator Rec.
- Water-based Rec.
- Multi-Fam. Res.
- High Density Res.
- Medium Dens. Res.
- Low Dens. Res.
- Salt Water Wetland
- Commercial
- Industrial
- Urban Open
- Transportation
- Waste Disposal
- Water
- Woody Perennial

The Mystic River: Openspace



2 0 2 4 Miles

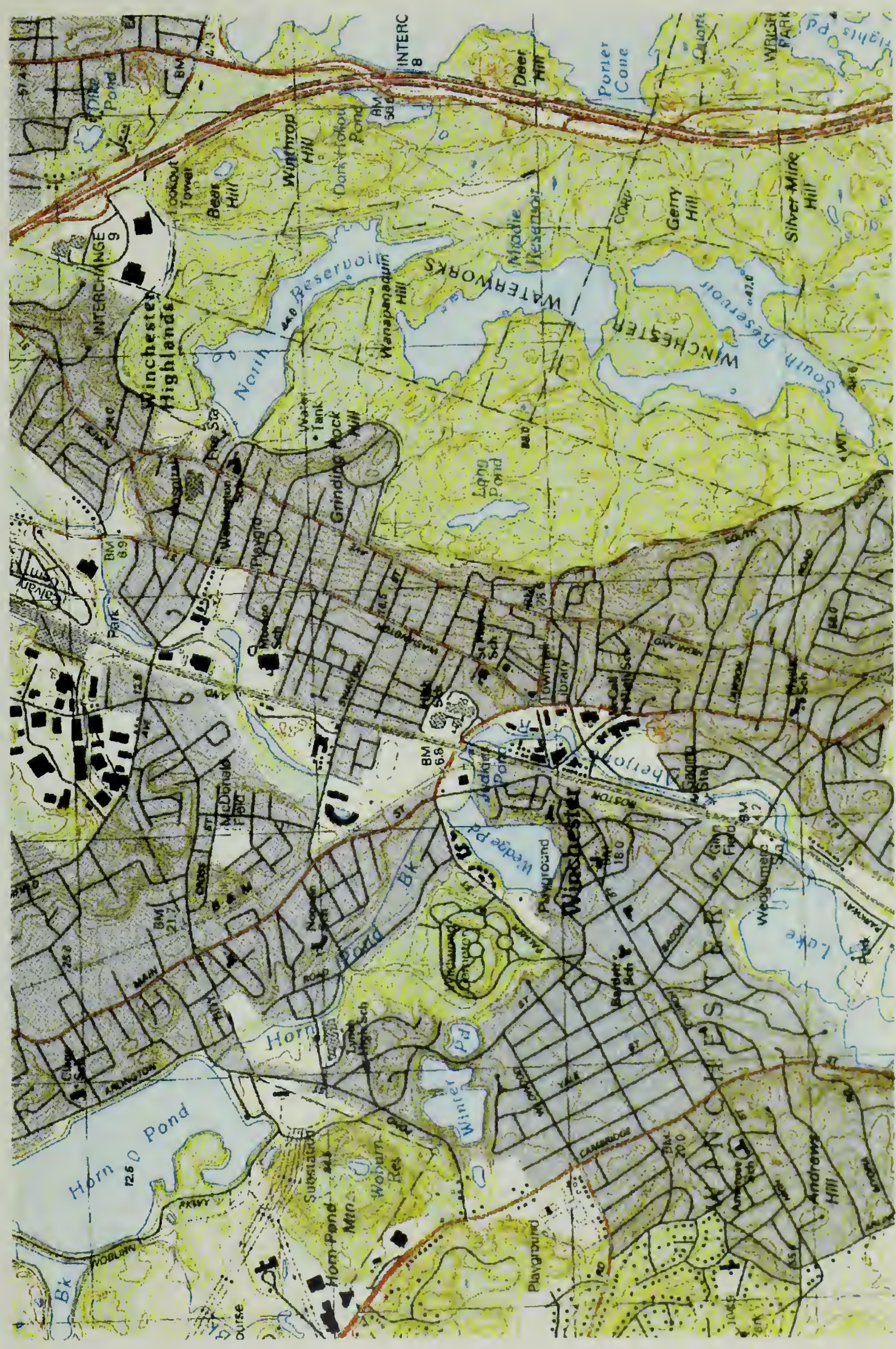
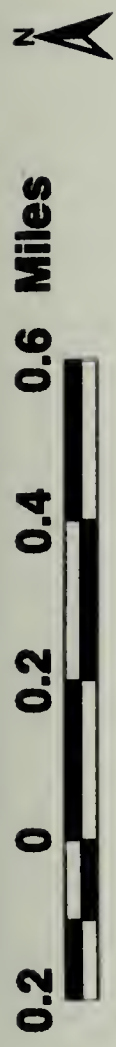
Roads

- Unpaved
- Secondary
- Interchange
- State Route
- US & Interstate
- Rivers & Streams

Lakes & Ponds

- Water (Lake, Pond, River)
- Ocean, Reservoir
- Flats & Shoals
- Wetlands
- Streams (5k)
- Protected Recreation and Openspace

Winchester Town Center: Aberjona River and Horn Pond Brook Confluence to Bacon Street Bridge



Mystic Lakes District: Bacon Street Bridge to Medford Street Bridge

0.2 0 0.2 0.4 0.6 Miles



**Alewife/Mystic Juncture, Alewife
Tributary, and Winthrop Square:
Medford Street Bridge to I-93 On/
Off Ramp**

0.2 0 0.2 0.4 0.6 Miles



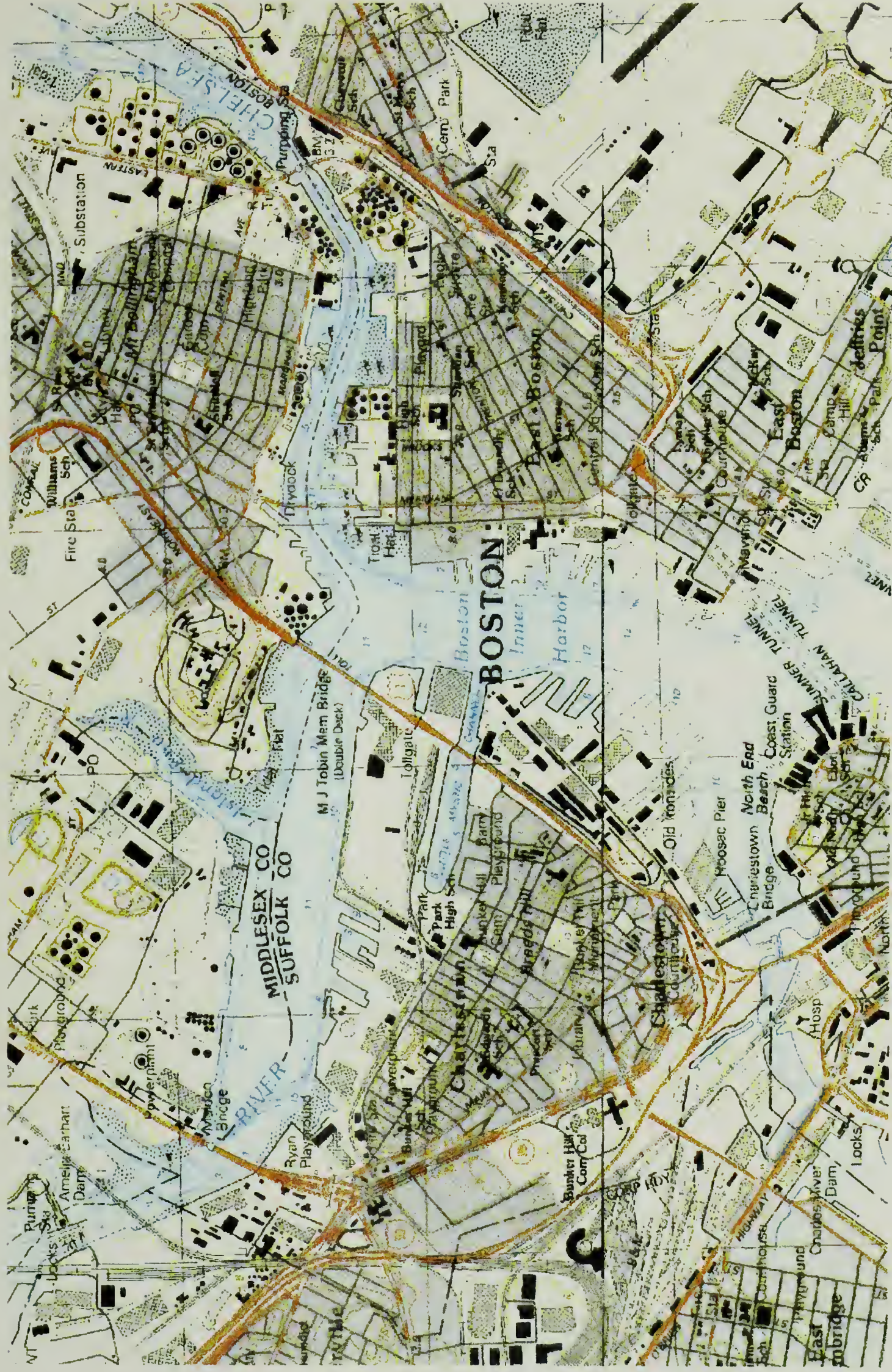
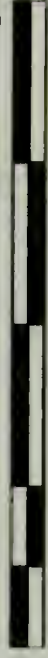
**Medford Square, Lower Basin, and
Malden Tributary: I-93 On/Off
Ramp to Amelia Earhart Dam**

0.2 0 0.2 0.4 0.6 Miles



Tidal Basin: Amella Earhart Dam to Boston Inner Harbor

0.2 0 0.2 0.4 0.6 Miles



Appendix B

Middlesex Canal Heritage Park Feasibility Study

MIDDLESEX CANAL HERITAGE PARK FEASIBILITY STUDY

Prepared for the
Middlesex Canal Commission
by the
Metropolitan Area Planning Council
and the
Northern Middlesex Area Commission

August, 1980

This project has been funded in part with the assistance of a matching grant-in-aid from the Department of the Interior, Heritage Conservation and Recreation Service through the Massachusetts Historical Commission, under the provisions of the National Historic Preservation Act of 1966.

MAPC Report #5

SUMMARY OF REPORT RECOMMENDATIONS

A distinctive quality of the Middlesex Canal is its linear structure and potential as a regional pedestrian and recreational connector. Enhancing this quality is the underlying purpose of the Middlesex Canal Heritage Park concept.

This report recognizes the regionality of the canal and recommends that more than sporadic, scattered efforts at preservation take place.¹ Recommendations included in this report require modest expenditures. Due to limited resources and competing needs, outright acquisition and restoration of the canal where-ever possible, is unrealistic. Therefore, the study recommends modest yet effective techniques to preserve the canal short of restoration of the old canal route.

A system of signs along the canal is a crucial first step in expressing the continuity of the route. In conjunction with signage, distribution of a good map of the canal route, emphasizing its relationship with the road system would be helpful in bringing the canal to the attention of a wider audience. The sign system would include:

1. A major identifying sign to be placed at all intersections of the canal route with major roads and highways.
2. A smaller identifying sign to be placed at the intersection of the canal route with local roads and streets.
3. An informational sign possibly including informative graphics or mapping to be placed at public areas along the canal route or at the location of extant or demolished canal features. Such signage may be part of interpretive sites.

All of these signs should be designed as a related group, using a similar typeface, color series, and logo. The larger signs should include a map of the entire route to reinforce the regionality of the canal.

Stabilization

Portions of the canal that exist should be regularly cleaned and checked for increased bank erosion, or for filling due to siltation or dumping. Corrective measures should be taken if necessary. In some places, the canal contains excessive litter. Periodic cleanup campaigns should be organized to improve these conditions. In addition, steps should be taken by local governments and the Canal Commission to safeguard remaining portions of the canal from development. Possible safeguards include the acquisition of land, easements along the canal route, or protective zoning regulations which either restrict development on the Canal or require a special permit within 50 feet of the canal.

¹ Sections of the canal in various communities have, in recent years been acquired, improved, and/or restored. These are admirable efforts which deserve much credit. Yet no attempt has been made to coordinate these efforts either physically or conceptually.

Restoration/Reconstruction

As previously stated, this report limits the amount of restoration and/or reconstruction proposed for the canal. However, sites do exist which are suitable for such treatment. Additionally, future public projects which may impact the canal could be used as a catalyst for restoration as was the case with the relocation of Route 129 in Wilmington by the Massachusetts Department of Public Works. However, unlike the Wilmington reconstruction, the canal should be restored to its original dimensions and employ authentic material and construction techniques.

Recreational Reuse of the Canal

Due to its linear nature and the existence of open spaces along its route, the canal offers excellent opportunities for both active and passive recreation.

1. Bikeways

A bikeway system is proposed beginning at the Somerville-Medford boundary, across the Mystic River on Boston Avenue through to Lowell. The bikeway, whenever possible, would use the canal route. However, it would mostly parallel the route using existing surface roads marked by signs.

2. Walkways

The canal route affords opportunities for the development of walkways. The walkways can be either dirt or hardtop paths, wide enough to accommodate strollers and wheelchairs.

3. Bi-ways

A graded dirt or paved path for both bicycle and pedestrian traffic is proposed for some segments of the canal.

4. Hiking Trails

Using the existing canal bed, towpaths can serve as hiking trails in many areas.

Interpretive Sites

Many points along the canal route are ideally suited for formal and informal interpretive sites. An interpretive site is one which provides the user an opportunity to gain insight into the past history and importance of the canal and the role it played in the region's economy and development.

Among the interpretive sites proposed along the canal route are exhibits, thematic recreation equipment in playgrounds, street and building murals, and landscaping to delineate the actual canal route.

Another interpretive opportunity exists in schools along the canal route. These schools (and possibly all schools in each of the nine canal communities) should incorporate the canal into the curriculum. Such an inclusion would promote a greater awareness and understanding of the canal and its role in the history of the community. This awareness and understanding could also create a greater willingness among local residents to see some of the recommendations implemented.

Mill Pond Heritage Park

The Talbot Mill/Mill Pond area of north Billerica presents a major opportunity to create Middlesex Canal focal point that could be developed into major historic preservation and recreation area. Although it is recommended that this area be marked by signage and interpretive material, it is recommended that the area be investigated further as part of the state's Park system.



Bi-walk along the Middlesex Canal.

Recommendation	Community(ies)	Possible Lead Agency(ies)	Possible Funding Source(s)
<u>Canal Signs</u>			
State Roads	All	Mass. Department of Public Works Metropolitan District Commission	Mass. Department of Public Works Heritage Conservation & Recreation Service
Local Roads	All	Local Department of Public Works	Local Funds
Informational	All	Local Department of Public Works Local Historic Commission Canal Commission	Heritage Conservation & Recreation Service Local Funds Heritage Conservation & Recreation Service
<u>Canal Stabilization</u>	All	Local Department of Public Works Canal Commission Local Service Organizations Metropolitan District Commission	Local Funds National Preservation Revolving Funds Private
<u>Restoration/Reconstruction</u>	Billerica Wilmington	Historic Commission Canal Commission	Heritage Conservation & Recreation Service Local Funds Private National Preservation Revolving Fund Mass. Self Help
<u>Recreational Reuse</u>	All	Local Parks Commission Metropolitan District Commission Conservation Commission	Mass. Department of Public Works Bond Issue Local Funds
Bikeways	Medford Winchester Woburn Wilmington Billerica Chelmsford Lowell	Mass. Department of Public Works Local Department of Public Works Canal Commission	Heritage Conservation & Recreation Service Community Development Block Grant Metropolitan District Commission
Walkways	Medford Winchester Woburn Wilmington Billerica Chelmsford Lowell		
BI Ways	Medford Winchester Woburn Wilmington Billerica Chelmsford Lowell		
Hiking Trails	Woburn Wilmington Billerica Chelmsford Lowell		
Interpretive Sites	All	Canal Commission Historic Commission	Heritage Conservation & Recreation Service Community Development Block Grant
Exhibits	All	Metropolitan District Commission Local Parkland Recreation Commission	Local Funds
Thematic Recreation	All		
School Curriculum	All	Conservation Commission	
Mill Pond Heritage Park	Billerica	Department of Environmental Management	Heritage Conservation & Recreation Service

The vagaries of the economy, canal condition, canal ownership and other aspects of the recommendations contained in this report make it difficult to pinpoint specific implementation costs. However, it is necessary that the relative costs associated with this report's recommendations be estimated to facilitate budgeting and allocation of resources for implementation. Therefore, the following estimate of approximate costs is offered to accomplish the above stated goals. It should be noted that these estimates are to serve only as a general guide. These estimates represent the relative magnitude of costs associated with the various recommendations. More detailed cost information should be incorporated into the detailed planning performed prior to implementation.

APPROXIMATE COSTS

	Signs	Stabilization	Restoration/ Reconstruction	Bikeways	BI Ways	Hiking Trails	Interpretive Sites	Thematic Recreation	Mill Pond Heritage Park
BOSTON	\$800	-	-	-	-	-	\$5-10,000	-	-
SCHERVILLE	4,000	-	-	-	-	-	5-10,000	10,000	-
MEDFORD	4,000	-	-	1,000	-	-	5,000	5,000	-
WINCHESTER	2,000	5,000	-	2,000	-	-	10,000	20,000	-
WOBURN	3,000	5-10,000	*	*	-	*	5-10,000	-	-
WILMINGTON	2,000	5-10,000	20,000	5,000	-	1,000	5,000	-	-
BILLERICA	6,000	10,000	-	3,000	100,000	2,500	15,000	-	400-700,000
CHELMSFORD	1,000	10,000	-	7,500	60,000	5,000	-	-	-
LOWELL	5,000	-	-	15,000	30,000	2,500	15,000	-	-

* Presently exists

The Middlesex Canal began on what is today Rutherford Avenue in Charlestown. The exact location is at the intersection of Rutherford Avenue and Mill Street, almost directly in front of the H.P. Hood and Sons building. While no trace of the canal exists today, as shown on Map 1, having been filled in and developed, the area retains its importance for regional transportation systems. All northern freight and commuter railroad lines converge and terminate in the railroad yards located south of the canal terminus. In fact, it was the Boston to Lowell Railroad which eventually caused the demise of the canal.

The Middlesex Canal was connected to the Boston waterfront by a canal extension. This extension connected the Mill Pond Tidal Basin to the Mill Creek Canal, which cut through the downtown Boston peninsula and terminated at the easterly side of the North Quincy Market building, located on the city's waterfront. (See Map 2). It is interesting to note that the granite used in the construction of Quincy Market traveled down the Middlesex Canal on its way from New Hampshire to Boston.

The southern terminus of the Canal is no longer visible due to industrial development, to the south and residential uses on the north. Bunker Hill Community College and the Phipps Street Burial Ground on either side of Rutherford Avenue represent the only open spaces in the vicinity of the Canal. (See Map 3).

Four canal locks and the Tidal Basin are buried. The two Charles River Tidal Locks are buried under the southbound lane of Rutherford Avenue, the Mill Pond Lock is buried under the Rutherford Avenue underpass, and the Malden Road Lock is located under the building located at 26 Alcorn Avenue. During the construction of Bunker Hill Community College, rumors persisted that traces of canal features had been unearthed. Cartographic research by Industrial Archaeology Associates, however, indicated no basis for these rumors. The Mill Pond Tidal Basin no longer exists. The Tidal Basin was filled to create developable land. Map 2 illustrates the difference between the coastline of Charlestown and Boston in 1800 and today.

Boston and Charlestown abound in historic resources, which is a blessing and a bane for the Middlesex Canal. The canal exists in a setting which is rich in historic character. This creates an opportunity for linking the Canal to those resources of Boston's heritage. However, these same historic resources tend to overshadow the Middlesex Canal. This overshadowing is compounded by the lack of any tangible remnant of the Canal and its setting adjacent to an industrial area.

Much of the area surrounding the canal route is or will be subject to redevelopment plans. Most notable are the City of Boston's plans to redevelop the North Station area and the City of Cambridge's plans to redevelop Lechmere Square. Each plan calls for an extension of the Charles Riverfront park to the new Charlestown Dam under construction. Extension of these parks will provide access opportunities to the points where the canal extension route intersected the river.

Boston

Physical Shape				Park Potential		
SEE. NO.	CANAL SEGMENT	APPROX. LENGTH	CONDITION	PRIORITY	RECOMMENDATIONS	NOTES
	Commercial Avenue to Causeway Street		Degradated	Medium	Signage	
	Causeway Street to Intersection of Rutherford Avenue & Mill Street		Degradated	High	Signage at proposed parks along Charles River, tidal power interpretive exhibit at BHC or Museum of Science	
	Intersection of Rutherford Avenue & Mill Street to Sullivan Square	2,000'	Degradated	Low	Marker implanted in Rutherford Avenue at actual Canal starting point	H.P. Hood & Sons has been very favorable to Canal heritage.
	Sullivan Square to Somerville City limits	1,750'	Degradated	Low	Signage	

Boston

Public Ownership

STANT CANAL FEATURES	SIGNIFICANT ENVIRONMENTAL FEATURES	NEARBY HISTORICAL FEATURES	APPROX. LENGTH IN P.O.	PUBLIC PROPERTY ON ROUTE	NEARBY SCHOOLS & PUBLIC LAND	NAT. REG. SEC.
None		Wealth of historic features	None			NA
None	Charles River	Phlips Street Burial Ground Bunker Hill Monument	None			NA
Yes		None			None	NA
None	None	None	1,000'	MBTA Yards	None	NA

RECOMMENDATIONS

Segment BOS-A. Commercial Avenue to Causeway Street

This segment contains the Mill Creek Canal extension which cuts through the Boston peninsula. This route lies under the dense development of downtown Boston. As shown on Map 4, signage is recommended for this segment at the easterly side of the North Quincy Market Building to denote the terminus of the Mill Creek Canal extension.

Segment BOS-B. Causeway Street to the Intersection of Rutherford Avenue and Mill Street

This segment contains the route taken by canal boats across the Mill Pond Tidal Basin to the start of the canal. Since this segment crosses the Charles River, it is recommended that signage be incorporated with plans contemplated for extending the riverfront parks into the Charles River Basin. The City of Boston is currently preparing plans for developing the river's edge with housing and a riverfront park in conjunction with a major redevelopment of the North Station area. Signage is recommended for this park. Despite its industrial nature, the other side of the river is contemplated for a riverfront park by the Metropolitan District Commission. Should such a development occur, signage is recommended to link this riverfront park to the open space contemplated by the City of Cambridge's Lechmere Square Development Project.

It is recommended that an interpretive exhibit be created to demonstrate the workings of the basin locks which employed tidal power. Such an exhibit could be placed at either Bunker Hill Community College or the Museum of Science.

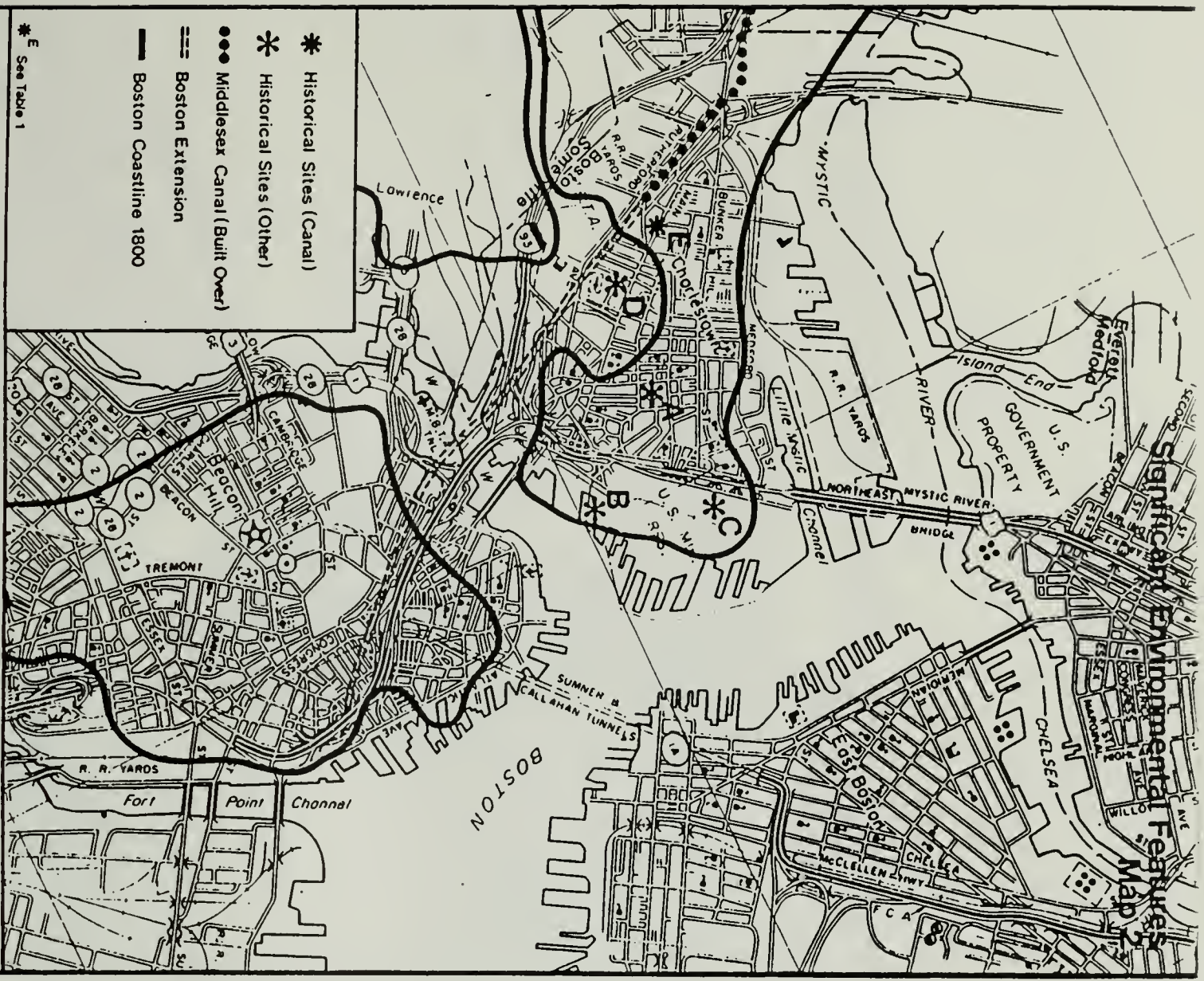
Segment BOS-1. Intersection of Rutherford Avenue and Mill Street to Sullivan Square

This segment represents the beginning of the Middlesex Canal. Signage presently exists on the H.P. Hood and Sons Building. A marker implanted in Rutherford Avenue at the actual location where the Canal began is recommended. The building located at 374-376 Main Street should be further studied to ascertain its role in the Middlesex Canal and to possibly preserve it as one of the few remaining Canal features in Charlestown.

Segment BOS-2. Sullivan Square to Somerville City Limit.

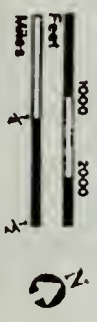
Running under the Sullivan Square traffic circle through the MBTA's Sullivan Square Bus Garage, this segment continues under the Interstate 93 rampway across Mystic Avenue into Somerville. Development and transportation improvements have totally obliterated traces of the Canal.

Significant Environmental Features
Map 2

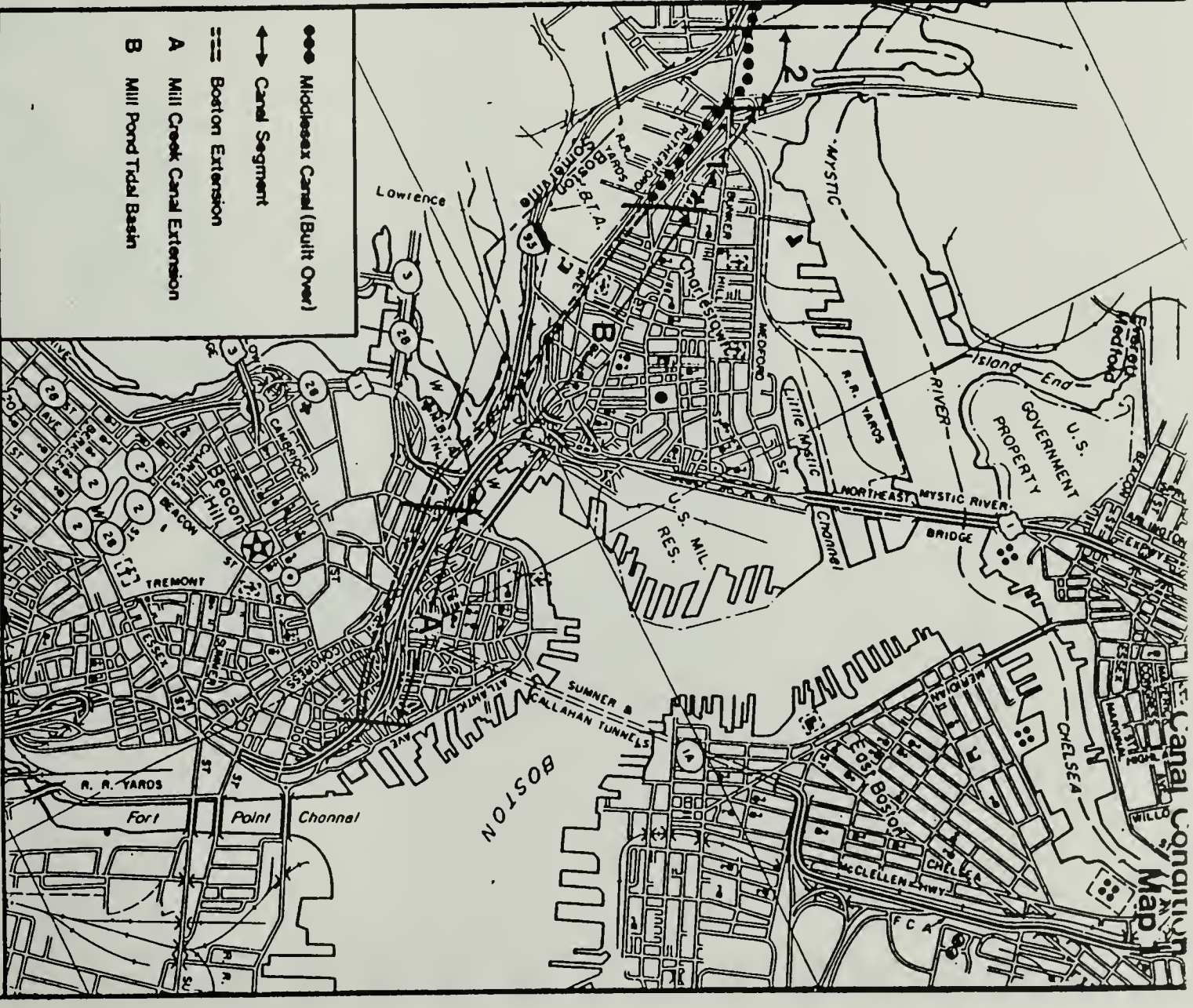


MIDDLESEX CANAL • BOSTON

Source: General Highway Map, Mass. Dept. of Public Works.
Prepared by:
Metropolitan Area Planning Council & Northern Middlesex Area Commission, 1980.

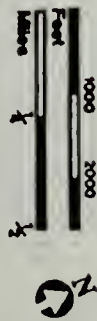


Canal Conduits
Map 1



MIDDLESEX CANAL • BOSTON

Source: General Highway Map, Mass. Dept. of Public Works.
Prepared by:
Metropolitan Area Planning Council & Northern Middlesex Area Commission, 1980.

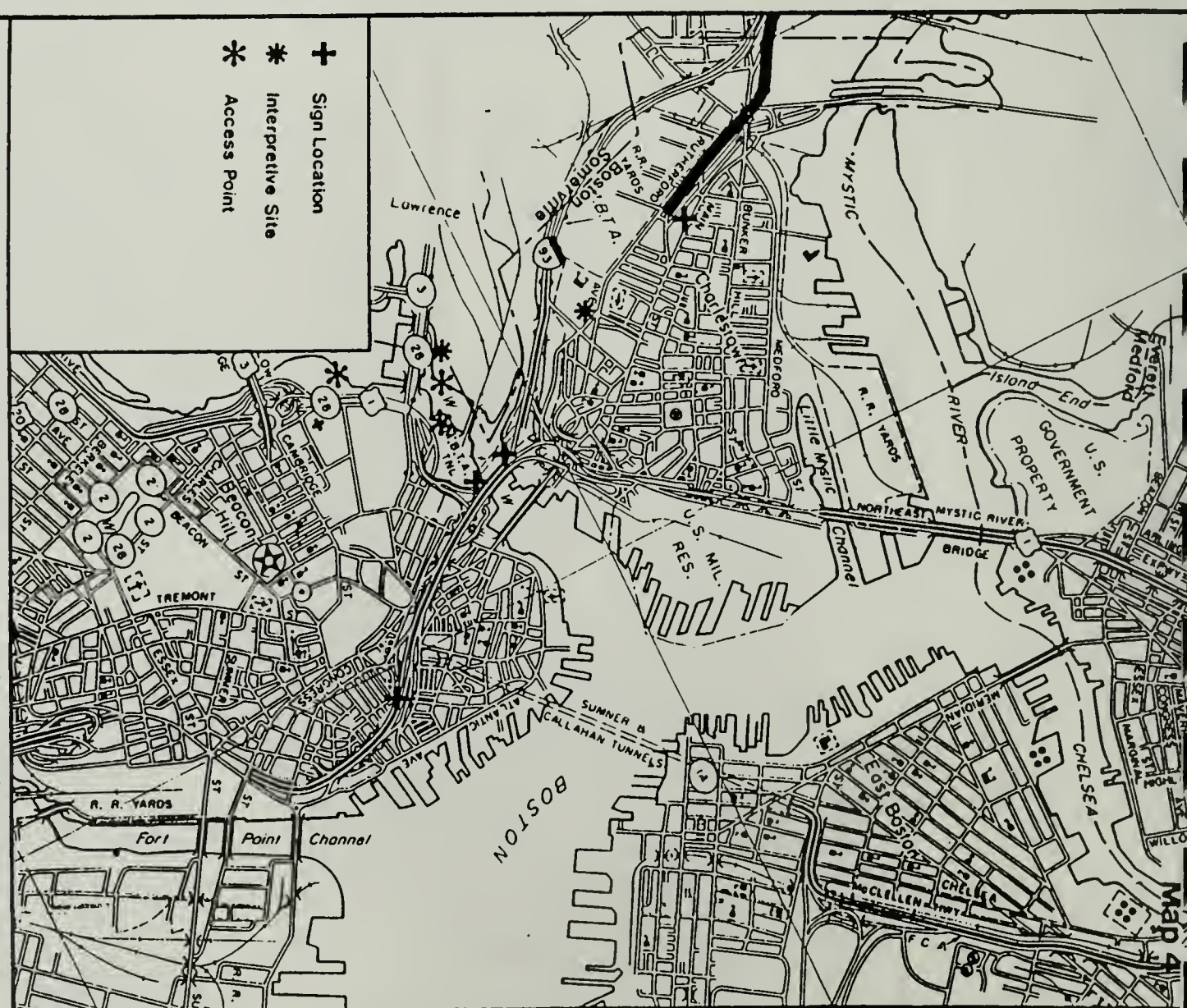




MIDDLESEX CANAL • BOSTON

Source: General Highway Map, Mass. Dept. of Public Works.

Prepared by:
Metropolitan Area Planning Council & Northern Middlesex Area Commission, 1980.



MIDDLESEX CANAL • BOSTON

Source: General Highway Map, Mass. Dept. of Public Works.

Prepared by:
Metropolitan Area Planning Council & Northern Middlesex Area Commission, 1980.

BOSTON

Inventory of Historic Buildings and Sites in the Middlesex Canal Corridor shown on Map 2.

- A. Bunkerhill Monument - Charlestown
- B. U.S. Constitution - Charlestown
- C. Boston Naval Shipyard - Charlestown
- D. Phillips Street burying ground
- E. Canal Related Building - 374-376 Main Street, Charlestown

BOSTON

Public and Semi-Public Land in the Middlesex Canal Corridor shown on Map 3.

- 1. Charles River Park - MDC owned
- 2. Bunker Hill Community College - Rutherford Avenue, Charlestown
- 3. Phipps Street Burial Ground - Rutherford Avenue, Charlestown
- 4. Sullivan Square MBTA Station
- 5. Sullivan Square MBTA Yards

Being the most densely populated city in Massachusetts, it is not surprising that Somerville shows no visible traces of the Middlesex Canal as shown on Map 1. After crossing the city boundary and travelling under Interstate 93, the canal travels through a residential neighborhood until it crosses McGrath Highway (Routes 1 and 28).

At this point, the canal route crosses Foss Park the first open land to be crossed. The canal, however, has been filled in to accommodate the athletic fields and swimming pool. At the southern end of the park by Broadway, a stone marker stands which briefly describes the Middlesex Canal.

From Foss Park the canal route again passes through a residential neighborhood as it turns towards Mystic Avenue as shown on Map 3. Before reaching Mystic Avenue, the canal route passes through the Mystic View Housing Project. From the Mystic View Housing Project, the canal route runs along the southern edge of Mystic Avenue to the Medford City boundary.

The canal re-enters Somerville briefly from Medford as it crosses the Mystic River at Boston Avenue. This section is discussed in the Medford portion of the report.

The land use along the Somerville Canal route (shown on Map 3) is predominantly residential with scatterings of commercial and industrial uses. This developed nature precludes any linear treatment of the canal. Mystic Avenue travels a course parallel to the canal, however, its high traffic volumes and design does not lend itself to a bikeway which would parallel the canal route. A riverfront park along the southern shore of the Mystic River begins in Somerville which parallels the canal route. Interstate 93 acts a barrier and isolates this recreational amenity from the canal route.

No known historic features related to the canal exist in Somerville. There are four historic features in the canal corridor which are unrelated as shown on Map 2. A Georgian Style Federal House is located at the intersection of Seawall and Temple Streets. The Oliver Tufts House at 155 Sycamore Street was built in 1714 and was the headquarters of Major General Lee during the Revolutionary Siege of Boston. Paul Revere Park at the intersection of Broadway and Main Streets marks the site of Winter Hill Fort and the course of Paul Revere's ride.

RECOMMENDATIONS

Segment SOM-1. City boundary to McGrath Highway

No specific recommendations are proposed for this segment.

Somerville

TOTAL CANAL LENGTH IN CITY APPROX

Physical Shape			Park Potential			
EG. O.	CANAL SEGMENT	APPROX. LENGTH	CONDITION	PRIORITY	RECOMMENDATIONS	NOTES
	City boundary to McGrath Highway	3,000'	Poor	Low	None	Passes under Interstate 93
	Foss Park	750'	Filled in	High	Interpretive exhibits landscaping and benches to denote actual Canal route, thematic playground equipment.	
	Foss Park to Temple Street	1,500'	Poor	Low	Signage	
	Temple Street to Medford City Boundary	3,000'	Built over and filled in	High	Interpretive exhibits, street and wall murals of Canal at Mystic View Housing Project; signage at Medford/Somerville boundary.	Perfect opportunity for historic preservation in a low and moderate income setting

Somerville

Public Ownership

EXISTING CANAL FEATURES	SIGNIFICANT ENVIRONMENTAL FEATURES	NEARBY HISTORICAL FEATURES	APPROX. LENGTH IN P.O.	PUBLIC PROPERTY ON ROUTE	NEARBY SCHOOLS & PUBLIC LAND	NAT. REG. SEC.
None	None	None				NA
None	None	None	750 ft.	Foss Park MDC Owned		NA
None	None	Federal House		None		NA
None	Mystic River	Oliver Tufts House Paul Revere Park	500 ft.	Mystic View Public Housing	Leahy School	NA

Segment SOM-2. Foss Park

Being a publicly owned undeveloped area, Foss Park affords excellent opportunity to be developed as an interpretive site as indicated on Map 4. The actual route of the Canal through Foss Park could be delineated with a walkway lined with benches, hedges, or berms to outline the trench and towpath. Signage at the park should be expanded to include historical graphics. A canal boat replica could be an added piece of playground apparatus.

Segment SOM-3. Foss Park to Temple Street

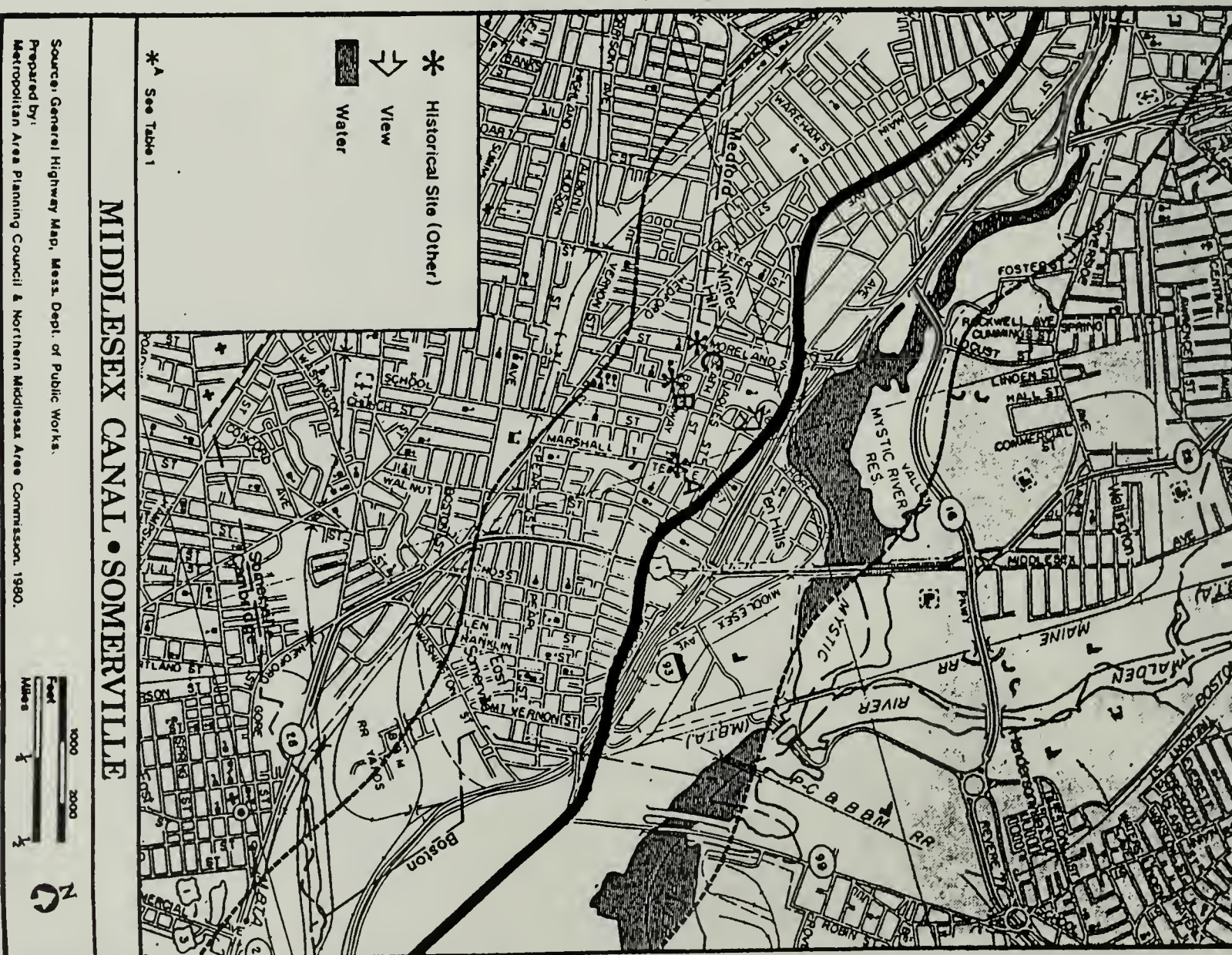
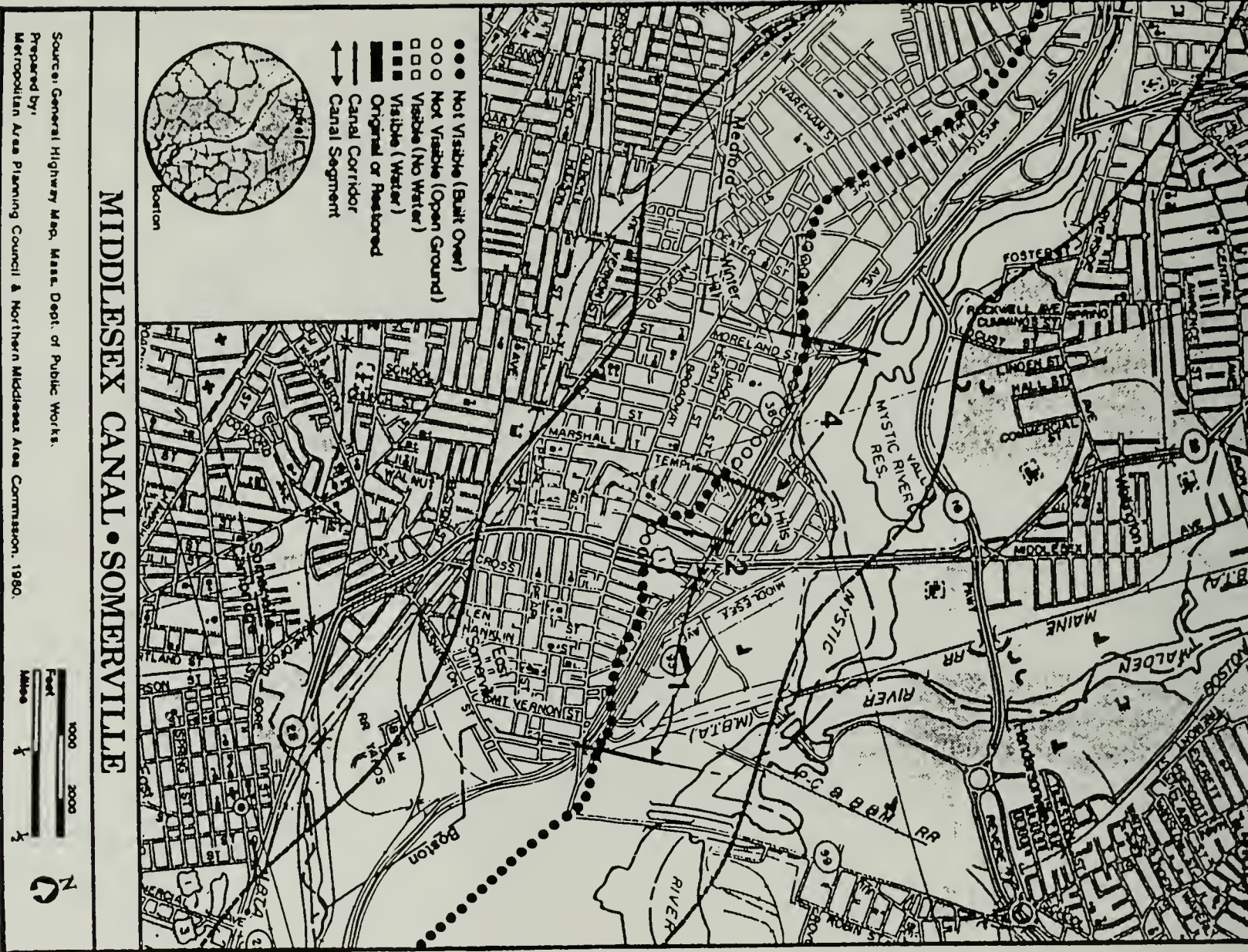
This segment of the canal route is built over by residential development. A sign is recommended on Temple Street at the location where the canal route passed.

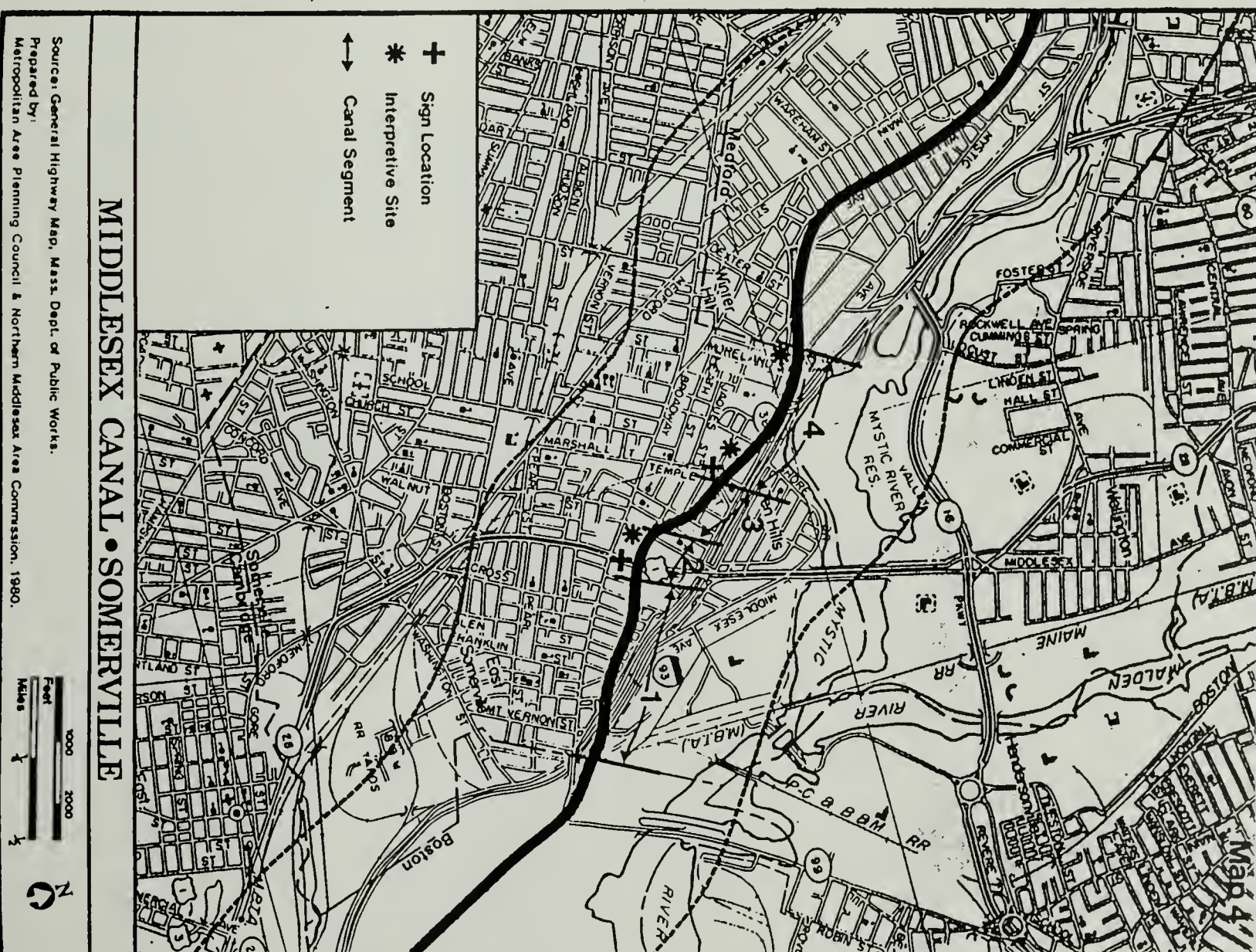
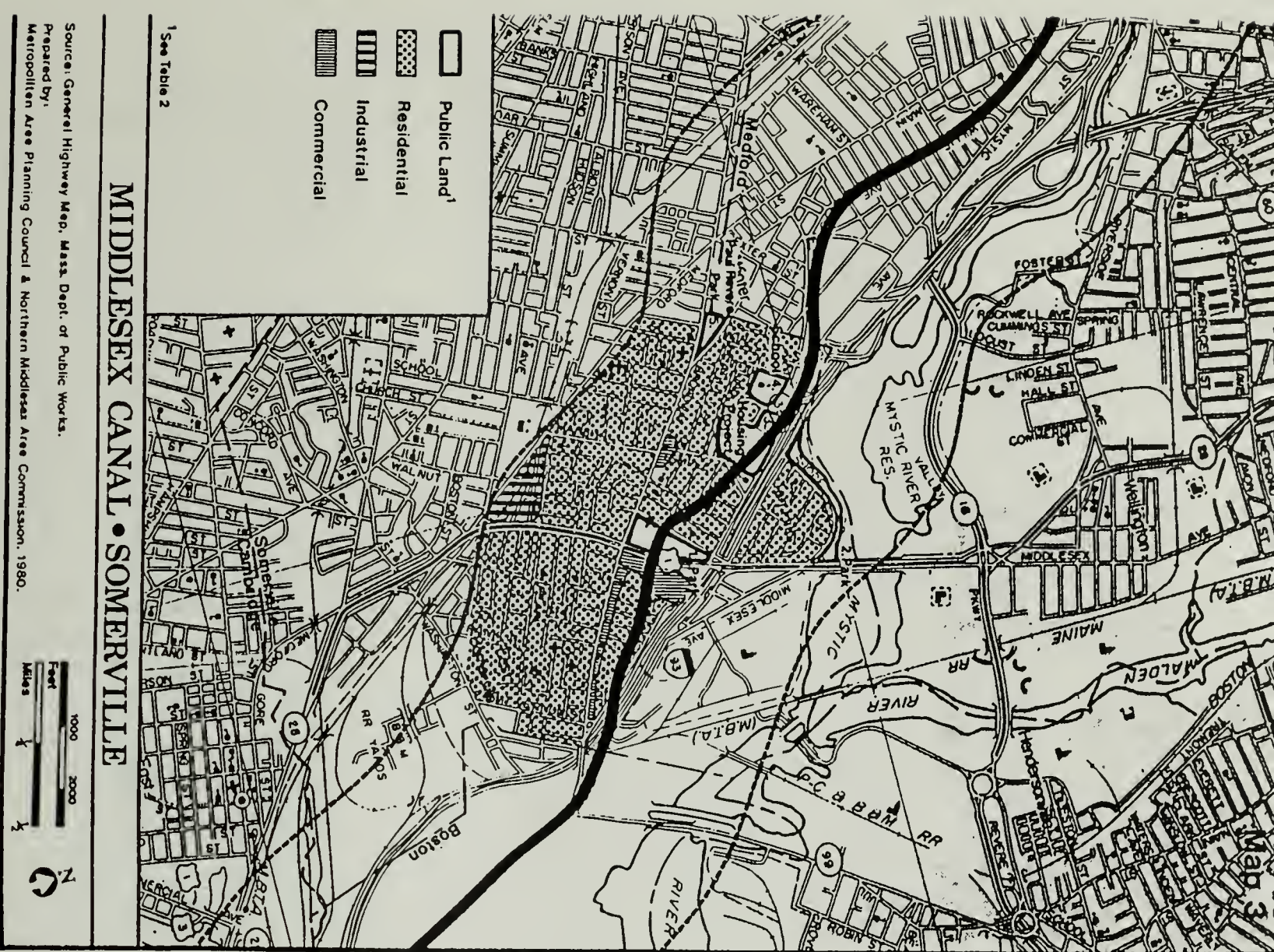
Segment SOM-4. Temple Street to Medford City Boundary

From Temple Street the canal route passes through the Mystic View Housing Project where signage and possible interpretive sites are proposed. In addition to signage, a community effort could possibly utilize project residents' talents (particularly children's) to delineate the canal route using sidewalk paintings and building murals depicting scenes of the canal. This will not only accentuate the canal route, but will positively affect the residential environment.

At the Somerville/Medford line, at the edge of Mystic Avenue, directly opposite the exit of Route 193, there is a small empty parcel with a billboard on it. The traffic and commercial-industrial character of the area make it an appropriate site for an interpretive display revealing the intersection of many different forms of transportation, starting with the Canal. An enlarged period painting depicting the ship building on the Mystic River mounted on the existing billboard should be explored.

*2000' buffer in Leitham
side of canal. That
was large for him*





SOMERVILLE
Inventory of Historic Buildings and Sites in the Middlesex Canal
Corridor shown on Map 2.

- A. Federal House: dwelling 1750 (Temple and Seawall St. State Reg)
Style: Georgian
- B. Oliver Tufts House: 1970 dwelling 155 Sycamore St. (State Reg)
Headquarters of Major General Lee during Revolutionary siege of
Boston.
- C. Paul Revere Park: Broadway - Main St., use: passive recreation.
Contains a lone pine tree thought to be the remainder of the
original planting in front of the Hittinger Mansion which was
destroyed, a stone designating the site for the Winter Hill
Fort used in the siege of Boston and later as a prisoner of
war camp and another stone designating the site of Paul Revere
on his famous ride.

SOMERVILLE
Public and Semi-Public Land in the Middlesex Canal Corridor
shown on Map 3.

- 1. Foss Park - MDC Owned
- 2. Mystic Riverfront - MDC Owned
- 3. Mystic View Housing Project - Mystic Avenue, Somerville
- 4. Healy School and Playground
- 5. Paul Revere Park - City Owned

MEDFORD

The City of Medford provides the first significant linear recreation potential that either parallels and/or utilizes the actual canal route. The Mystic River, which eventually turns into Mystic Lake, has an extensive waterfront parkway system and roadways which are owned and maintained by the Metropolitan District Commission.

The City of Medford contains a rich historic heritage which, in part, can be linked with the Canal. As a major shipbuilding center during the 19th century, the industry depended on a New Hampshire wood supply which was transported over the canal. From the canal, it was transferred to the shipyards located on the Mystic River by a canal extension.

Medford abounds in historical sites, many of which are located in the canal corridor illustrated on Map 2. Among these sites are the Isaac Royal House which was built in the 18th century, the Greek Revival Paul Curtis House, and several homes which belonged to the influential Brooks family of West Medford.

The canal route crosses predominantly residential areas in Medford, which have been developed over the canal as shown on Map 3. Open stretches of land on the canal route are limited to publicly owned properties through or near which the canal passes. Among these properties are Columbus School and Playground, Tufts Playground, Barry Playground, Cummings Park, Thomas Brooks Park, and the Brooks Playstead. Additionally, the Mystic River and Lakes Parkway system provides an occasionally intersecting and parallel linear park system.

Through its route in Medford, the first potentially extant feature of the canal is visible as it crosses the Mystic River. The embankments of what is now the Boston Avenue Bridge over the canal are said to be constructed with stone used in the original aqueduct.

The City of Medford represents the first opportunity for recreational and interpretive uses of the canal route accessible to a significant number of persons.

RECOMMENDATIONS

Segment MED-1. City Boundary to Columbus School

After entering the City of Medford, the canal route veers away from Mystic Avenue and crosses a commercial area into Columbus School and Playground. This offers an opportunity for an interpretive site, as shown on Map 4, which could possibly be integrated into the school curriculum. Possible programs include highlighting the exact canal route on the school property through landscaping, street art, or other means. Students could be assigned to projects on the canal and its importance to the City of Medford. Reports, painting or even model building are some proposed activities. A sign noting the canal's route should be placed at the school.

Segment MED-2. Columbus School to Hancock School

From the Columbus School the canal lies under residential development. The Hancock School could incorporate the canal into its curriculum as well as use interpretive exhibits.

Segment MED-3. Hancock School to Winthrop Street

No visible features of the canal remain in this segment. However, this area was the location of the canal extension, the most significant canal feature in Medford. The Canal Extension connected the canal to the Mystic River where the shipbuilding yards were located. It is recommended that signage with accompanying charts and diagrams be posted at or near the intersection of Main Street and Mystic Avenue to mark the Canal extension and its importance to early Medford's development. One of the commercial tenants in the area might be amenable to sponsoring this exhibit.

Segment MED-4. Winthrop Street to Alewife Brook Parkway (Includes part of Somerville)

The canal lies under residential development and passes through Leahy Square where a small marker exists honoring a World War I hero. Since the canal passed under this site, a second marker is recommended to note the canal's route. From Leahy Square the canal passes through residential, commercial, and industrial uses, crossing the Boston and Maine Railroad and briefly entering the City of Somerville as it joins Boston Avenue.

Segment MED-5. Alewife Brook Parkway to Arlington Street

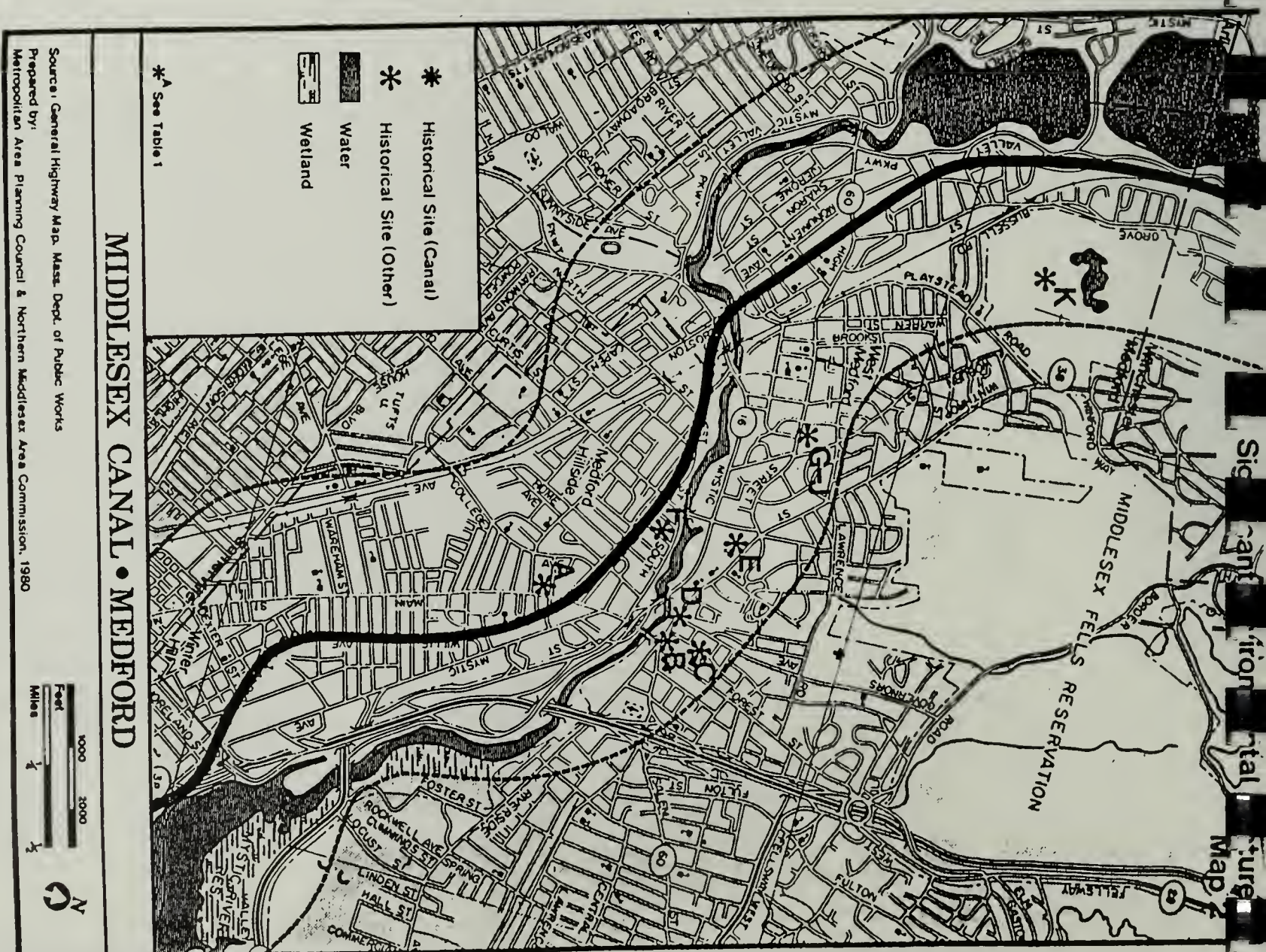
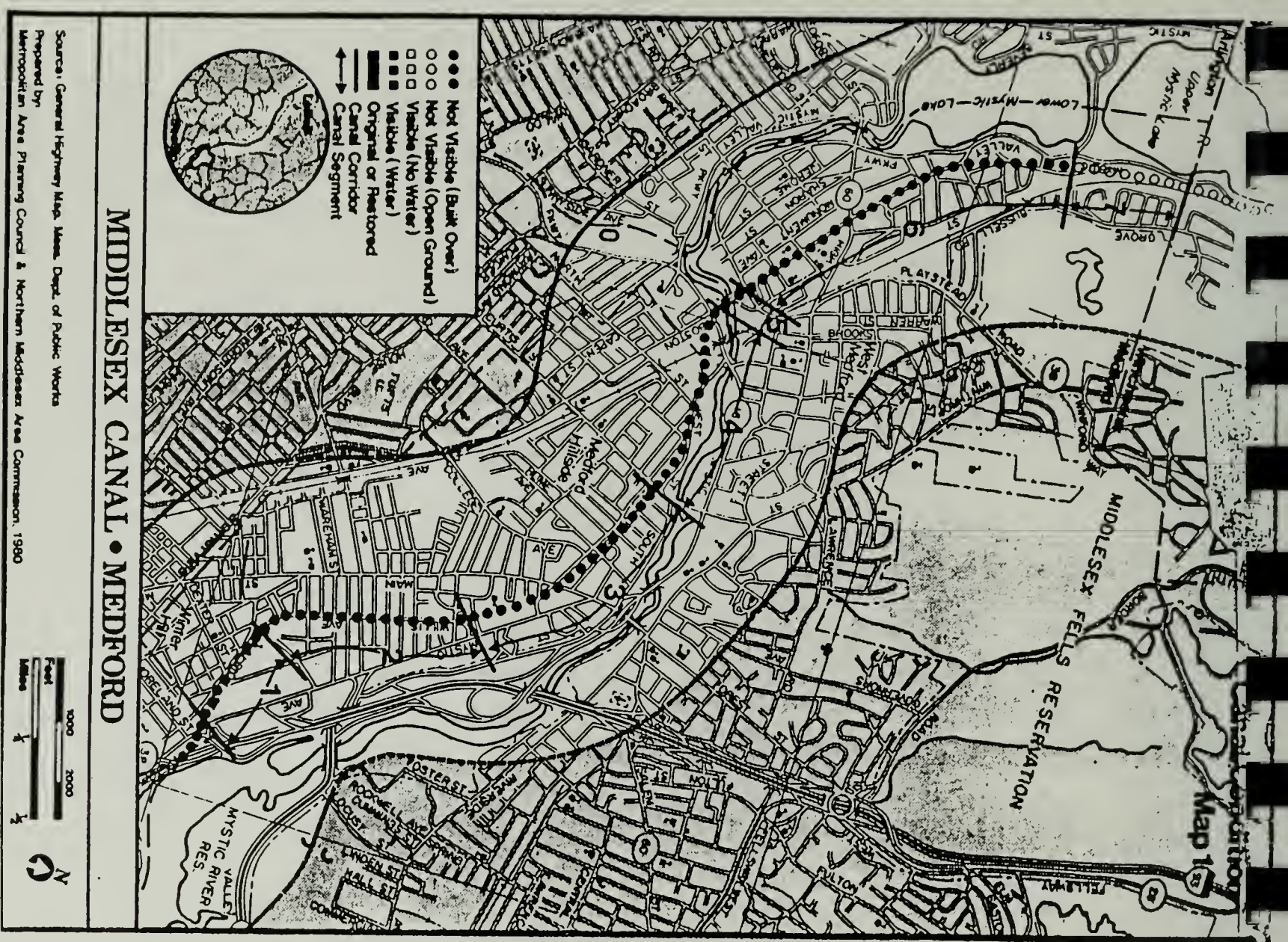
The first visible remnants of the canal appear in this area. Since this segment intersects with the Mystic River Park system of the MDC, this area holds potential as a prime interpretive site as well as an area for linking linear recreational opportunities with the remaining portion of the canal route. Here, by an aqueduct, the canal spanned the Mystic River, and Bilson's Lock elevated the canal for the first time, since it left Charlestown. The canal bed lies under Boston Avenue, and the stone footing of the bridge is said to be a remnant of the aqueduct. The first building on the right after crossing the bridge is said to be an old tavern, popular during canal trips.

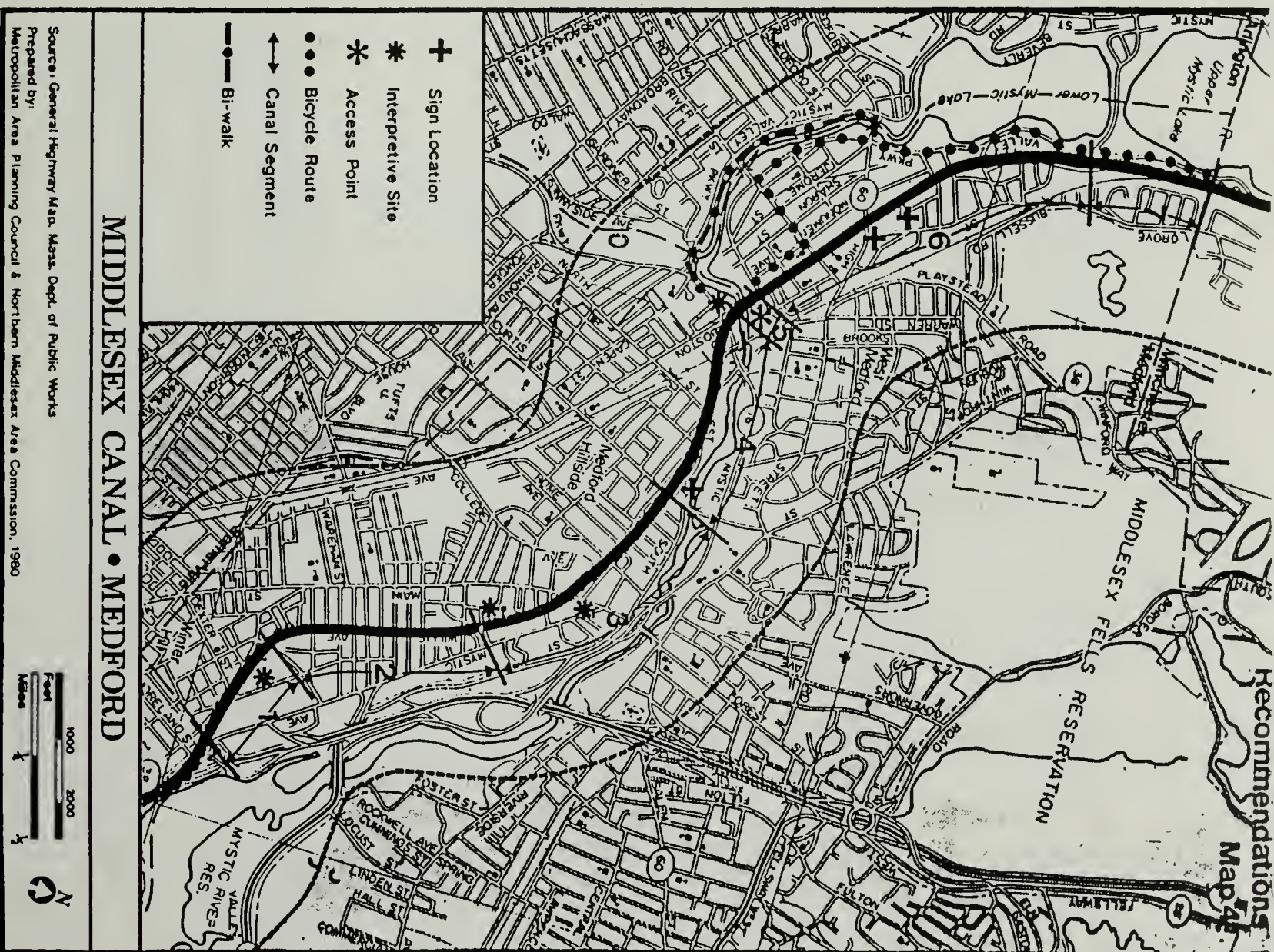
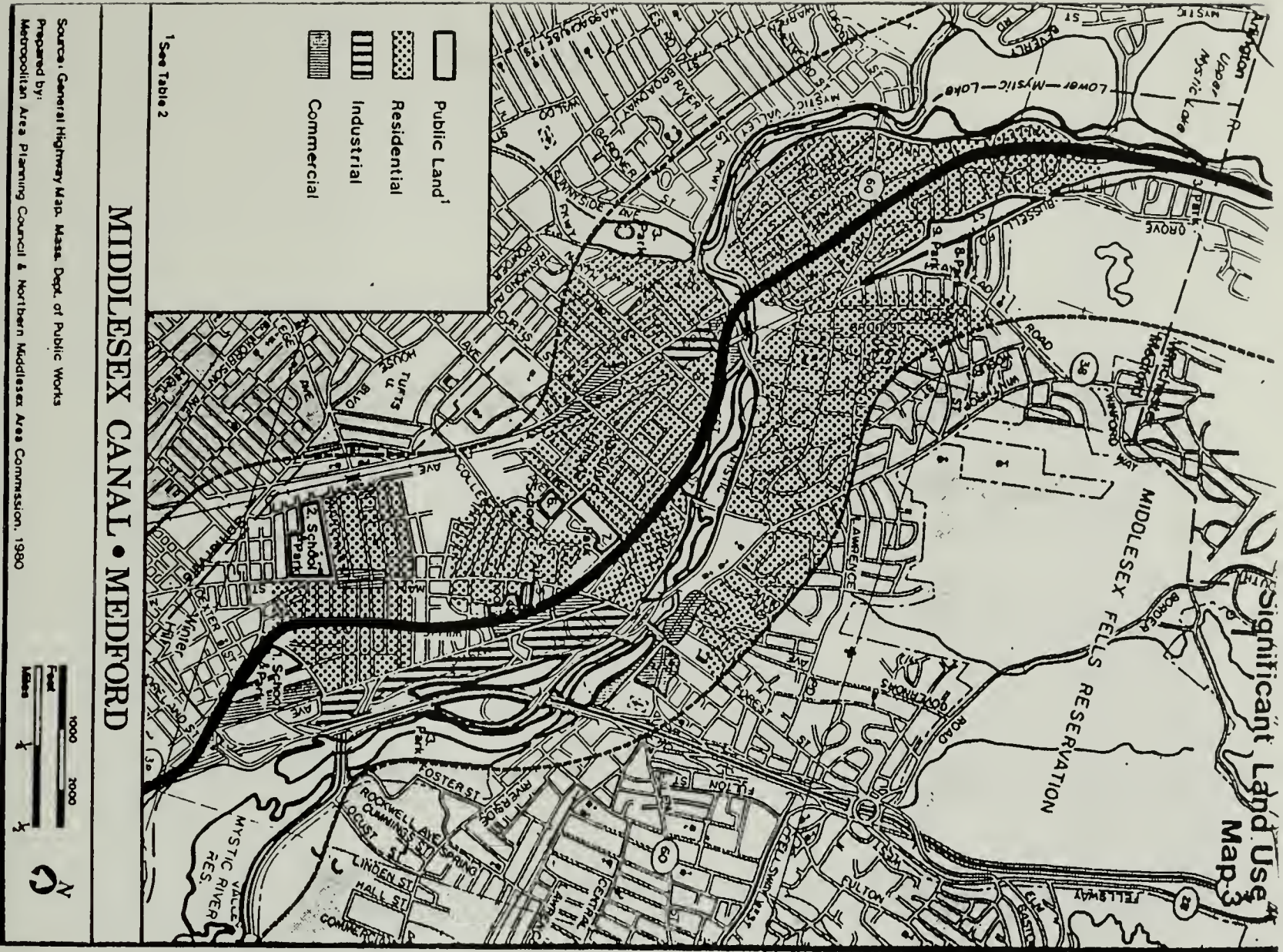
It is recommended that the cities of Somerville and Medford collaborate with the MDC in developing this segment as an interpretive site to connect with other canal-related interpretive sites along the MDC Mystic Park system, i.e. bikeways, jogging, hiking, or cross country skiing.

It is at this section where a bikeway which will travel the remaining portion of the canal route is recommended to begin. This starting point would provide accessibility to nearby residents of Cambridge, Arlington, Medford and Somerville.

Segment MED-6. Arlington Street to Mystic Valley Parkway

The canal route continues up Boston Avenue, crosses High Street and continues under the present-day Sagamore Avenue.





Where the route crosses High Street, a sign is suggested to note where it crosses the route of Paul Revere's Ride.

The Brooks Bridge, located at the site of the Sagamore John monument on Dagamore Avenue once spanned the canal to connect the farm of Peter Brooks. Although considered to be a significant architectural structure, the bridge was torn down in 1911. A marker is recommended at the Sagamore John monument containing a sketch or photograph of the bridge.

Segment MED-7. Mystic Valley Parkway to Winchester Town Line

The canal route joins with the MDC roadway to the Winchester line. Bikeways and signage are recommended along this recreational corridor which represents the first substantial undeveloped stretch of the canal route.

Medford

TOTAL CANAL LENGTH IN CITY APPROX. FOUR

Physical Shape				Park Potential		
SEG. NO.	CANAL SEGMENT	APPROX. LENGTH	CONDITION	PRIORITY	RECOMMENDATIONS	NOTES
1	City boundary to Columbus School	2,500	Filled	Medium	Interpretive exhibit at Columbus School inclusion of canal in school curriculum	
2	Columbus School to Hancock School	4,000	Built over	Medium	Interpretive exhibit at Columbus School inclusion of canal in school curriculum	
3	Hancock School to Winthrop Street	3,750	Built over	Medium	Signage and Interpretive site at site of intersection of Medford Branch Canal	Possible participation of commercial use
4	Winthrop St. to Alewife Brook Parkway	2,000	Built over	Medium	Signage	Enters Somerville again
5	Alewife Brook Parkway to Arlington Street	500	Filled in or Built over	High	Recreational interpretive mode beginning of bikeway	
6	Arlington St. to Mystic Valley Parkway	4,000	Filled in or Built over	Medium	Bikeway	Crosses route of Paul Revere Ride
7	Mystic Valley Parkway to Winchester Town Boundary	4,000	Filled	High	Bikeway, signage	First significant undeveloped stretch of canal route

Medford

Public Ownership						
EXTANT CANAL FEATURES	SIGNIFICANT ENVIRONMENTAL FEATURES	NEARBY HISTORICAL FEATURES	APPROX. LENGTH IN P.O.	PUBLIC PROPERTY ON ROUTE	NEARBY SCHOOLS & PUBLIC LAND	NAT. REG. SEC.
None	Mystic River	None	500 ft.	Columbus School	Columbus School	NA
None	Mystic River	None	300 ft.	Hancock School		NA
None	Mystic River	Royal House Curtis House		None	Barry Playground	NA
None	Mystic River	Royal House Curtis House	50'	Park		NA
Stone abutments of Boston Avenue Bridge	Mystic River		100'	MCC Mystic River Park	MCC Mystic River Park	NA
None	Mystic River	Brooks House			Brooks	NA
None	Mystic River	Shepard Brooks Estate	2,000'	Mystic River Reservation		NA

MEDFORD

Inventory of Historic Buildings and Sites in the Middlesex Canal Corridor Shown on Map 2.

- A. Isaac Royal House: (Museum dwelling) Main & 15 George St., Medford
 - 1732 Isaac Royal Sr. merchant of Antigua purchased and rebuilt house which had been home to Lt. Gov. John Usher.
 - 1739-75 Home of Col. Isaac Royal Jr. - Gov. Council 23 years.
 - 1782-84 Col. Gary Washington's aid who leased house.
 - 1790 Boarding & Day school conducted by Wm. Woodbridge.
- B. Isaac Hall House: 43 High St., Medford, 1720
- C. Jonathan Wade House: 13 Bradlee Rd., Medford
 - The Jonathan Wade House with its surviving 17th and 18th century facades is a rare example of early New England brick architecture. The Wade House, Peter Tufts House and Isaac Royal House are the only survivors of the six more brick houses built in Medford in the 17th century. Wade House is listed on National Reg.
- D. Lawrence Light Guard Armory
- E. Grace Episcopal Church: 160 High St., W. Medford
 Designed in 1867 was one of H.H. Richardson's earliest works.
- F. Paul Curtis House: 114 South St., Medford
 The Paul Curtis House is Medford's most elaborate example of Greek Revival architecture. House is listed on the National Register of Historic Places. In 1839, Paul Curtis established his own shipyard on the North Bank of the Mystic River where between 1839-1852 27 ships had been constructed at this site.
- G. John Wade House: 253 High St., Medford
- H. Charles Brooks House: 309 High St., Medford
 Charles Brooks House was constructed before the birth of Charles Brooks and was owned for a period of time by his Uncle Isaac Brooks and later by his father Jonathan Brooks. During ownership; house known as "the Lilacs" Brooks (1795-1872) was a Unitarian minister and educational reformer.
- I. Thomas Brooks House: High St., Medford
 Various local sources have been built as early as 1692. House bought in 1791 by Jonathan Brooks III, from John Brooks Jr. Jonathan Brooks family who owned most of West Medford during 17th, 18th and 19th century.
- J. George P. Fernald House: 12 Rock Hill Rd., Medford
 The Fernald House is the most architecturally distinguished Colonial/Federal Revival House in Medford.
- K. Shepard Brook Estate: 275 Grove St., Medford
 SBE is among the most architecturally distinguished late 19th century summer residence extant in Medford and the only estate to survive with extensive acreage of undeveloped land.

MEDFORD

Public and Semi-Public Land in the Middlesex Canal Corridor Shown on Map 3.

1. Columbus Park (city owned)
2. Tufts Park (city owned)
3. Veterans Memorial Park (M.D.C. owned)
4. Hancock School
5. Brooks Park (city owned)
6. Dome School
7. Barry Playground (city owned)
8. Brooks Playstead (city owned)
9. Thomas Brooks Park (city owned)

WINCHESTER

The first visible traces of the Middlesex Canal appear in the Town of Winchester as shown on Map 1. There are two separate locations where the canal is visible. The first is at Sandy Beach Reservation on the Mystic Lake. A paved path, under which sewer trunk lines are buried, is located on the Canal bed. On either side of the path remains of the canal berms are visible though overgrown with vegetation. The second area is between the backyards of the homes along Sheffield Street and Fletcher Road. However, the private ownership of the canal traces and their inaccessibility to the public, limit the amount of public utilization of these traces.

In addition to development which has altered the landscape of the canal route, the formation of a lake has altered the area where the canal once crossed the Aberjona River. During the operation of the canal, the northern portion of the Upper Mystic Lake was non-existent. At the point the canal route crosses the present Mystic Lake, marked the place where the Aberjona River flowed into the lake. Construction of a dam between the Upper and Lower Mystic Lakes has created this existing northeast portion of the lake.

No traces remain of Gardner Double Locks and Tavern located on the northern side of Mystic Lake. As the canal route continues, it passes through a neighborhood of private homes of historical significance as shown on Map 2.

The only significant stretch of open space accessible to the public is Wildwood Cemetery, shown on Map 3 which is owned and maintained by the Town of Winchester. The Palmer Playground is across Palmer Street. Nearby on a parallel course with the canal route is the Horn Pond Brook Park.

Before leaving Winchester, the canal route crosses Horn Pond Brook. This Brook was the secondary source of water for the canal, after the Concord River.

RECOMMENDATIONS

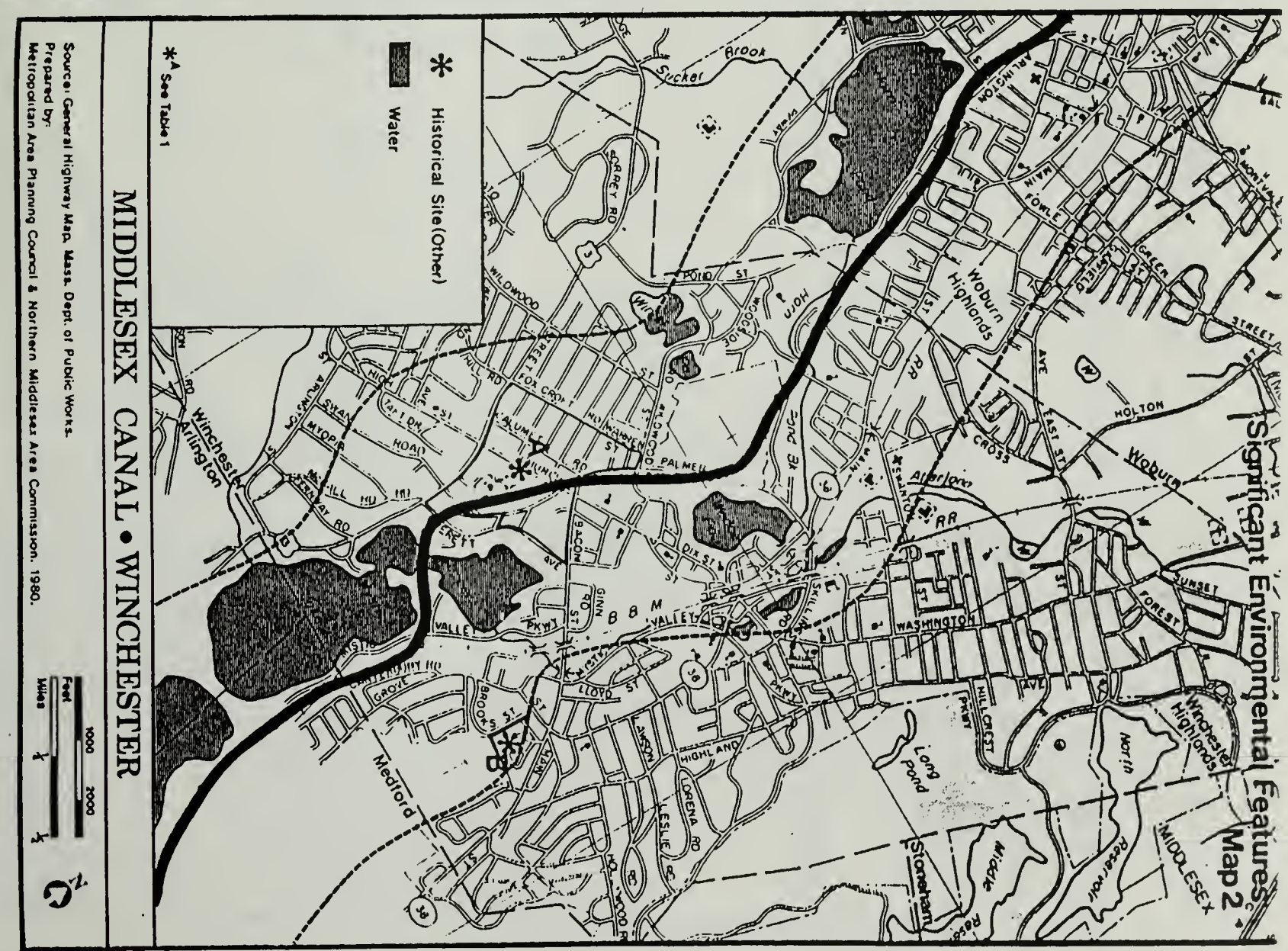
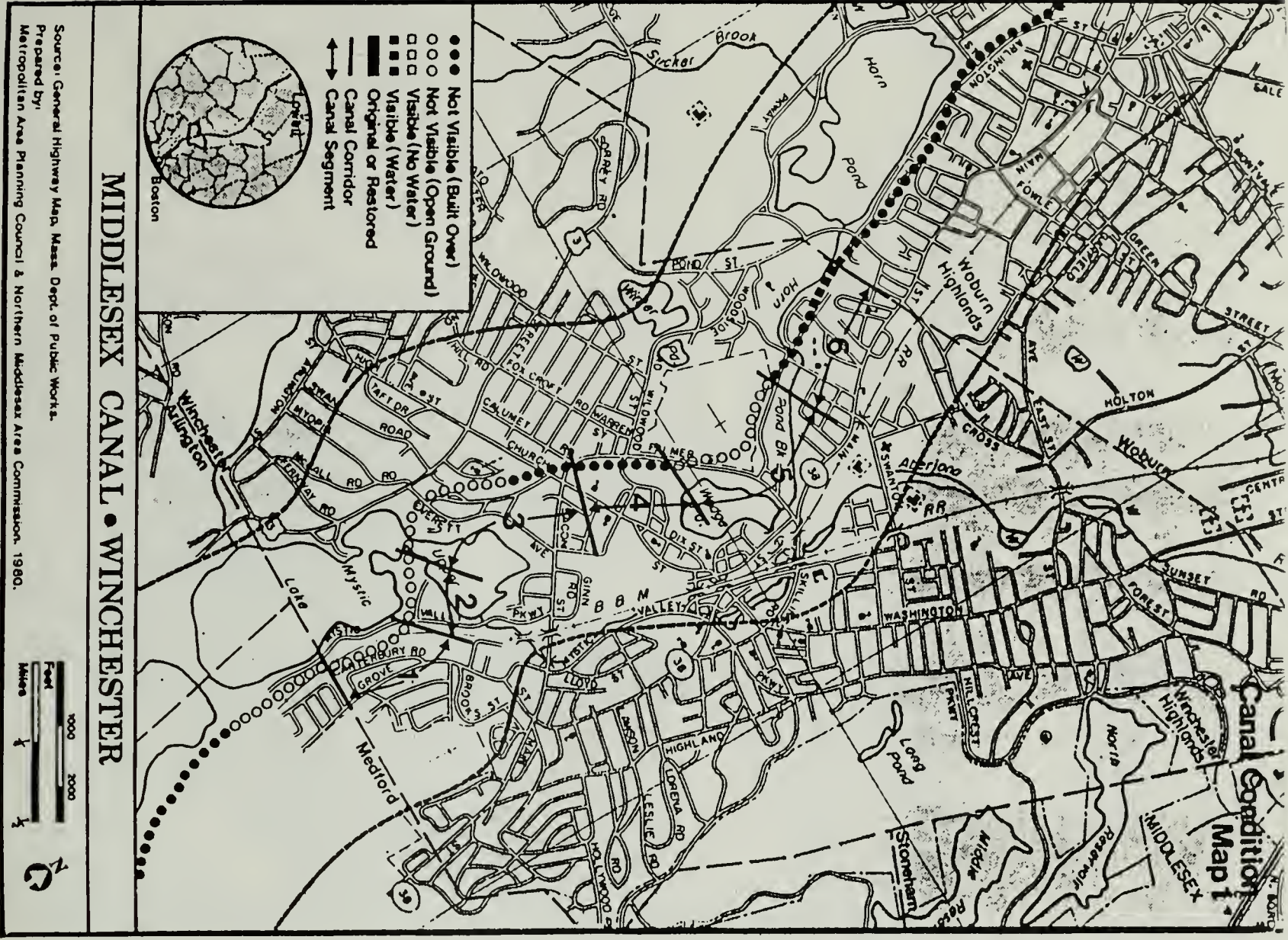
Segment WIN-1. Medford City Boundary to Sandy Beach

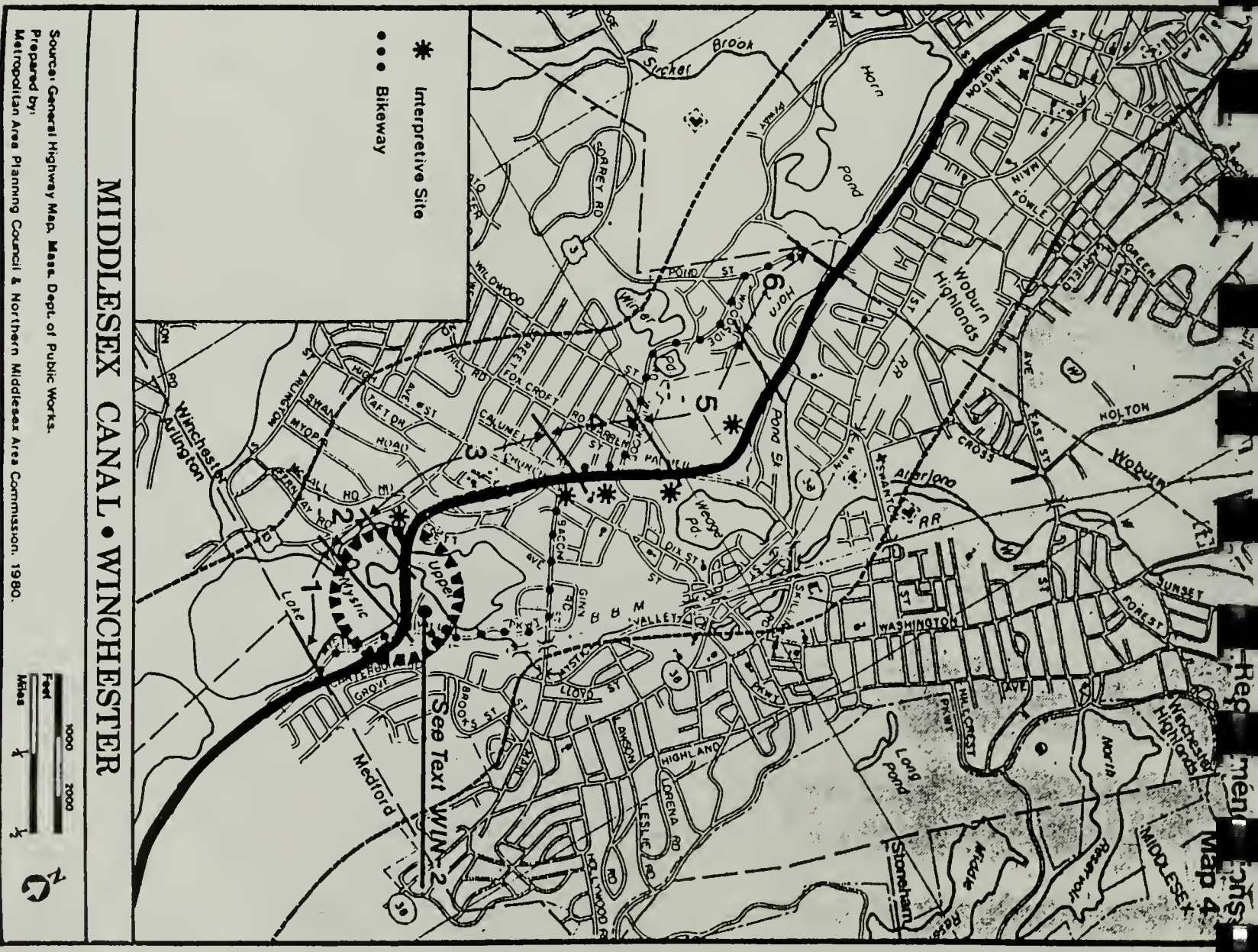
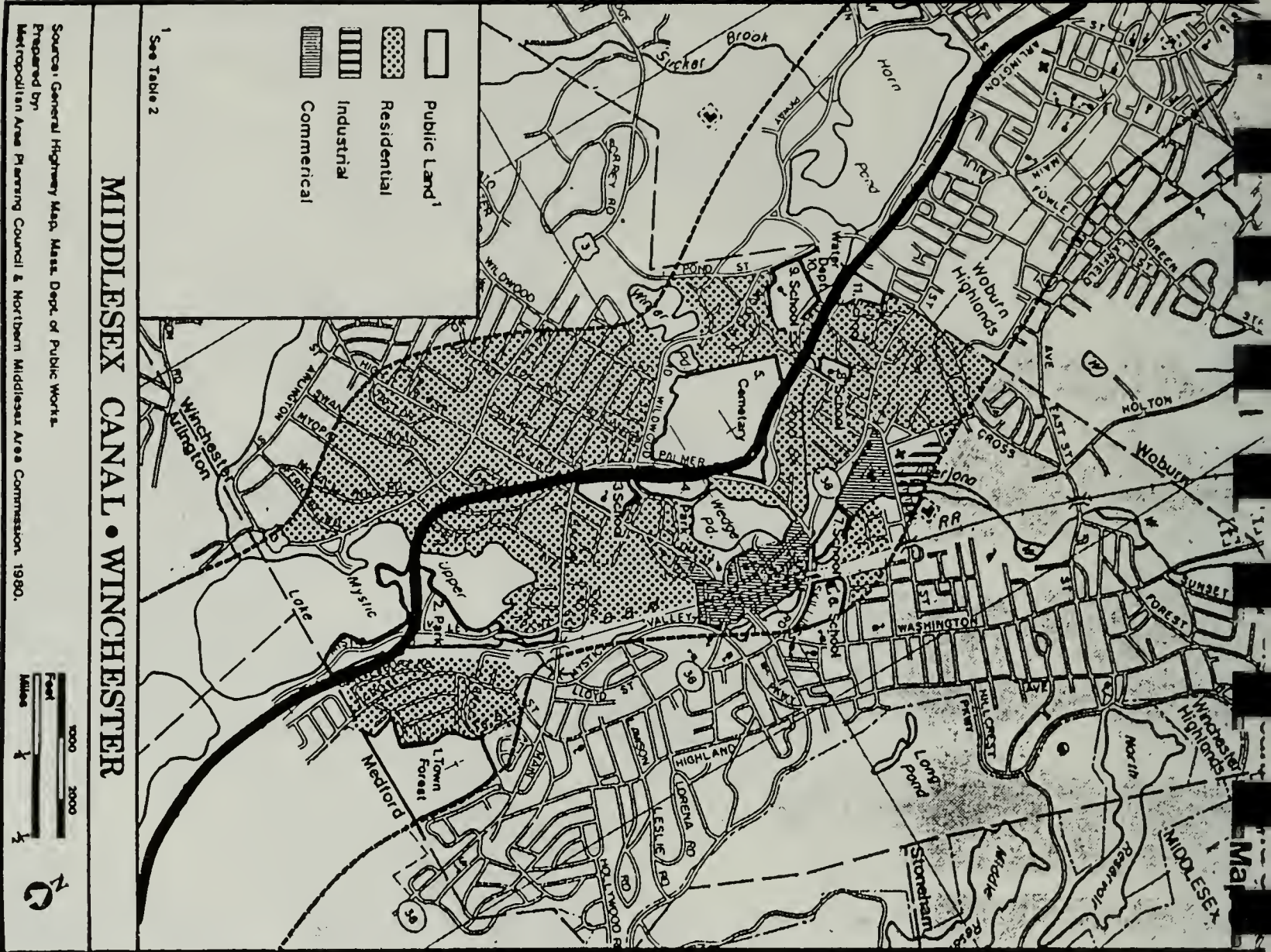
This segment represents a continuation of the linear recreation corridor along the Mystic Valley Parkway. Bikeways and trails for hiking and jogging are recommended in addition to signs along the Canal route.

Segment WIN-2. Sand Beach Reservation

Sandy Beach Reservation is a peninsula created as a result of the construction of a dam between the Upper and Lower Mystic Lakes. Prior to the dam's construction, this area was the southern bank of the Aberjona River which entered the Mystic Lake.

Presently owned by the Metropolitan District Commission, Sandy Beach serves as a public swimming and recreation area. It is at Sandy Beach, where the first traces of the canal become visible. A paved pathway travels the peninsula on what was formerly the canal bed. On either side of the pathway, traces of the canal bank are visible and extend the length of the path. Where the pathway terminates on the shore of the Mystic Lake, a stone parapet or embankment was built by the MPA in the 1930's using stone





from the canal aquaduct which crossed the Aberjona River to the opposite shore.

Sandy Beach is recommended as a site for design treatment. Among the factors contributing to the selection of this site are, public ownership, present recreation use, accessibility, and visible remnants of the canal. This design should serve as a prototype for other recommended actions along the Canal to enhance its preservation.

Design Objectives

1. To maximize public awareness of the Middlesex Canal through meaningful interpretive sites.
2. To capitalize on the linear nature of the canal for recreational opportunities.
3. To seize opportunities which minimize land acquisition.
4. To minimize costs associated with implementation.
5. To be transferable to other sites along the canal route.

Design Recommendations

In order to achieve these objectives, the proposed design treatment concentrates on two major areas. The first is to preserve and enhance the remaining canal features and trace through physical improvements and informational exhibits along the canal route. The second is to provide an active interpretive opportunity for children through thematic recreation planning and development.

The first area is addressed by replanting along the existing canal bank to accentuate its presence. In addition to signage, permanent exhibits utilizing graphic aids should be installed to describe the history of the canal and its importance to the early commerce of the region. As the canal route travels towards the lake shore, it is recommended that the fence surrounding the stone parapet be removed. At the parapet, a graphic representation of the original aquaduct and a map of the area before the Aberjona was converted to the present lake could assist viewers in visualizing the site's past.

The interpretive goal is achieved by the proposed refitting of the existing playground area with apparatus reflective of the canal. An example of this would be scaled-down replicas of canal boats, constructed of durable material, sunk into the ground in a mock canal bed. Other thematic apparatus could include miniature buildings such as toll houses, warehouses or gate keeper's homes. Wading pools or sand boxes could be constructed which resemble the locks used along the canal route. A miniature aquaduct would illustrate how the canal was able to cross many of the obstacles along its route.

This area may contain the remains of a lock keeper's aquaduct keeper's cottage

Vinchester

TOTAL CANAL LENGTH APPROX. TWO AND A HALF

Physical Shape			Park Potential			
EG. NO.	CANAL SEGMENT	APPROX. LENGTH	CONDITION	PRIORITY	RECOMMENDATIONS	NOTES
	Medford City boundary to Sandy Beach Reservation	1,500'	Filled in	High	Bikeway & Signage	
	Sandy Beach Reservation	1,250'	Visible - partially filled	High	Interpretive recreation, landscaping to enhance remaining canal banks	First visible trace of canal
	Mythic Lake to Bacon Street	4,000'	Filled in some visible traces	Medium	Interpretive site Bikeway	
	Bacon St. to Palmer playground	1,750'	Built over	Low	Interpretive site Bikeway	
	Palmer playground to Middlesex St.	3,000'	Filled in	Medium	Interpretive site Bikeway	
	Middlesex Street to Auburn City boundary	2,000'	Built over	Medium	Signage Interpretive site Bikeway	Horn Pond Brook was the only secondary water source for canal

Winchester

OF TOTAL LENGTH

Public Ownership

EXTANT CANAL FEATURES	SIGNIFICANT ENVIRONMENTAL FEATURES	NEARBY HISTORICAL FEATURES	APPROX. LENGTH IN P.O.	PUBLIC PROPERTY ON ROUTE	NEARBY SCHOOLS & PUBLIC LAND	MAT. REG. SEC.
None	Mystic Lake	None	1,500'	MDC Mystic River Reservation		NA
Canal banks stone aboutment of aqueduct. Some visible traces	Mystic Lake	None	1,250'	Sandy Beach		NA
None	Mystic Lake	33 historical homes in general vicinity		None	None	NA
None	None	None	1,500'	School Palmer playground		NA
None	Wedge Pond	None	3,000'	Wittwood Cemetery		NA
None	Horn Pond Brook	None	500'	Jr. High School	Jr. High School	NA

These recommendations are indicative of the types of treatment available to provide children not only an opportunity to play, but to learn and pleasantly experience their heritage.

Segment MIN-3. Mystic Lake to Bacon Street

Passing through the backyards of privately owned homes and partly visible at some spots, the canal is inaccessible to the public. Two potential interpretive sites exist in this segment. The first, at the intersection of Edgewater Place and Sheffield Road which was the site of Gardner's Double Locks. The second is at the intersection of Church and Fletcher Streets and Sheffield Road. This site was the location of Hufmeister's Bridge and marked the intersection of the municipal boundaries of Charlestown, Medford, and Woburn before Winchester incorporated.

Segment MIN-4. Bacon Street to Palmer Playground

Segment MIN-4 passes through the Wyman School grounds. Interpretive exhibits and inclusion of the canal in school curriculum is recommended.

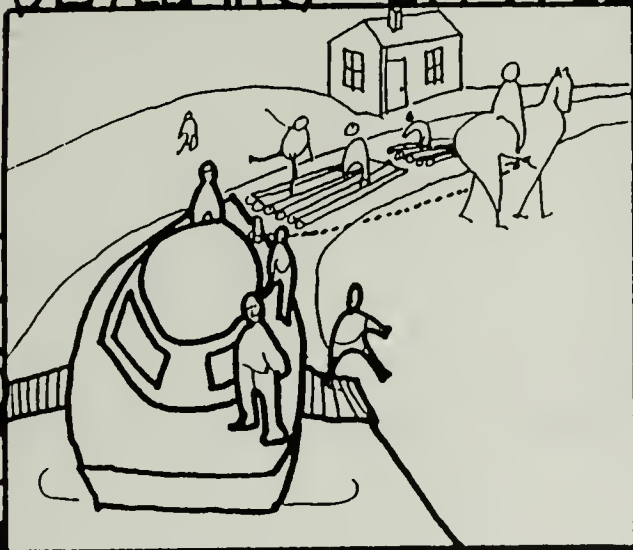
Segment MIN-5. Palmer Playground to Middlesex Street

This segment represents a stretch of open space along the canal route suitable for both passive and active interpretive sites. The Palmer Playground is suitable for a thematic treatment similar to Sandy Beach. Wildwood Cemetery is suitable for more passive interpretive exhibits.

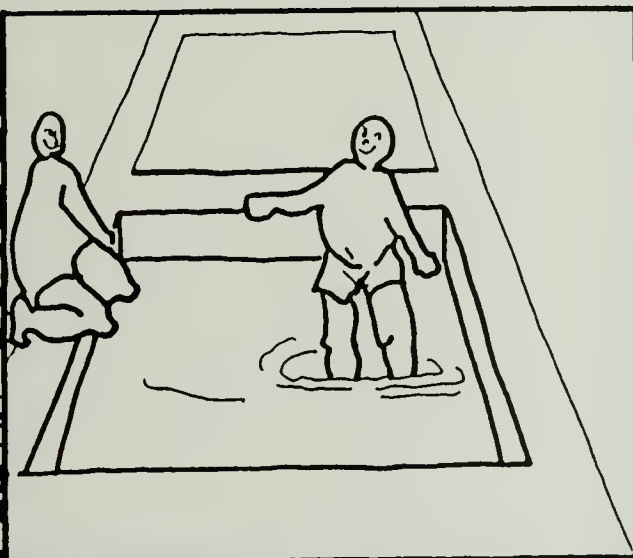
Segment MIN-6. Middlesex Street to Woburn City Boundary

Signage is recommended along the canal route. The bikeway will rejoin the canal route shortly after entering Woburn.

POSTS



745072



SHOT FISH

POOLS WARD

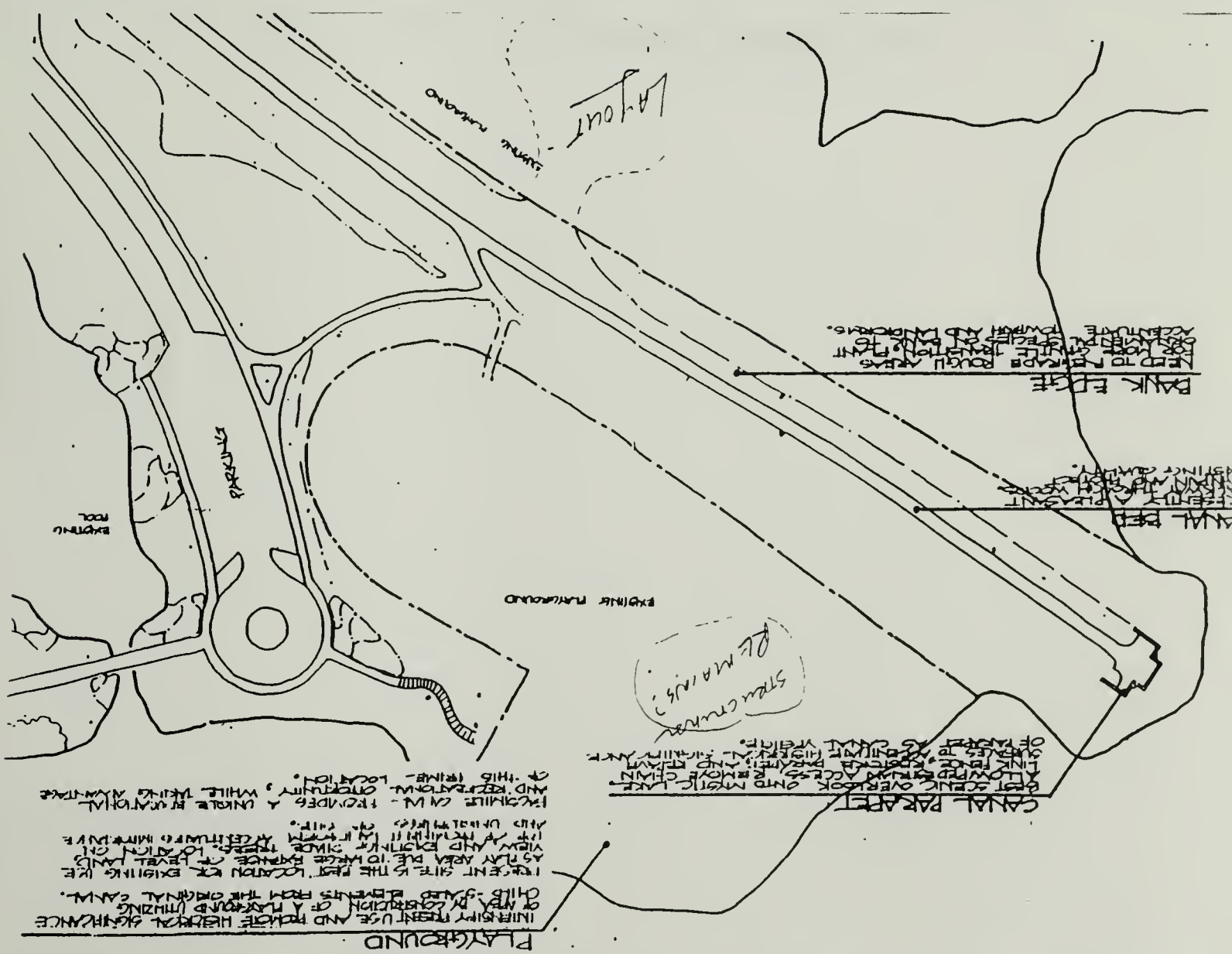
BARRELS



ॐ



EXPLORE TOLL



WINCHESTER

Historic Buildings and Sites in the Middlesex Canal Corridor Shown on Map 2.

- A. Area of 23 inventoried homes.
- B. Symmes Corner - 5 inventories properties connected with Symmes family.

WINCHESTER

Public and Semi-Public Land in the Middlesex Canal Corridor Shown on Map 3.

- 1. Town Forest
- 2. Sandy Beach
- 3. Wyman School
- 4. Palmer Playground
- 5. Wildwood Cemetery
- 6. Junior High School
- 7. Winchester High School
- 8. Noonam School
- 9. Lynch Jr. High School
- 10. Water Department

Appendix C

Storm Drain Detective Sample Results



Save the Harbor Save the Bay

Founded 1986

MEMORANDUM

To: Storm Drain Detectives
From: Jodi Sugerman, Policy Director
Date: June 17, 1997
Re: STORM DRAIN DETECTIVE SAMPLE RESULTS

At long last, all of the results from our last sampling event have been received. Thank you to all of the volunteers who took time out of their Memorial Day weekend to collect samples. The results are outlined below, along with some preliminary analysis and some suggested next steps. You should all have sampling kits and appropriate collection bottles for the tests outlined below. Please let me know ASAP if you need anything prior to the next storm. In the mean time, I will be contacting team leaders with draft letters to their municipal officials. Thank you again! Feel free to call me with any questions.

Background

On May 25, Storm Drain Detective volunteers collected samples of discharge from four pipes located within the Mystic River watershed. Samples were analyzed for fecal coliform bacteria, oil & grease, copper and lead. Prior to sampling it had been raining steadily for several hours. The following is a summary of the results from this sampling event.

PIPE 1

Location: Pipe 1 is located on a small tributary of the Mystic River located where Winthrop Street crosses Route 16. It is concrete and about 1.5' by 1.5' in size.

Physical Observations: The area smelled similar to a "wet dog" and the discharge was slightly murky and dark in color. Volunteers identified a Night Heron near the site as they approached the pipe. Flow from the pipe was fast and steady.

Fecal Coliform:	40,000/100 ML
Oil & Grease:	21.4 parts per million
Copper:	24 parts per billion
Lead:	17 parts per billion

PIPE 2

Location: Pipe 2 is located off of I-93 near the boat house in Ten Hills, Somerville. The pipe is concrete.

Physical Observations: Volunteers noted the presence of oil and grease and of several species of birds. Also, while testing, volunteers experienced a huge surge of discharge accompanied by a paper cup, a plastic bag and a newspaper.

Fecal Coliform: 3,000/100 mL
Oil & Grease: 30.5 parts per million
Copper: 95 parts per billion
Lead: 31 parts per billion

PIPE 3

Location: Pipe 3 is located on Spy Pond at Pleasant Street and Route 2 in Belmont.

Physical Observations: Volunteers noted the presence of white bubbles and several condoms 1 - 2 ' from the pipe.

Fecal Coliform: 26,000/100 mL
Oil and Grease: none detected (note detection limit is 8.6 mg/L)
Copper: 20 parts per billion
Lead: 8 parts per million

PIPE 4

Location: Pipe 4 is the Winn Brook Culvert on Little Pond in Belmont.

Physical Observations: Volunteers noted the presence of a whitish sheen in the slower water near the discharge point. Volunteers also noted the presence of bubbles, toilet paper and wildlife.

Fecal Coliform: 120,000 /100 mL
Oil and Grease: none detected (note detection limit is 8.6 mg/L)
Copper: 33 parts per billion
Lead: 8 parts per million

DATA INTERPRETATION:

Fecal Coliform: Using several data sets, the MWRA did a review of fecal coliform levels in storm drain discharge between 1988 and 1992 and found the average to be about 38,000/100 mL. Using this information alone, it seems that fecal coliform levels in almost all of the samples taken (with the exception of Little Pond in Belmont) fall

within the range of typical urban stormwater. However, there are many different factors affecting what is construed as "normal" bacteria levels in stormwater most important of which is the size of the drainage area. From areas less than 90 acres, levels are usually between 1,600 - 3,000/100 mL. For drainage areas greater than 150 acres levels range between 43,000 - 85,000 mL. Based on this information it appears that fecal coliform levels at both Pipe 1 and Pipe 4 are abnormally high.

- Pipe 1: Based on what we believe is the size of the drainage area to this pipe, fecal coliform levels of 40,000/100 mL may be indicative of a problem such as an illegal connection.
- Pipe 4: Levels of 120,000/100 mL are extremely high using any guideline. Because volunteers also identified condoms and toilet paper in the waters, it is likely that there is an illegal sewage connection to this pipe.

Oil and Grease: According to the Baseline Water Quality Assessment prepared by the MWRA (in order to inform their CSO plan), oil and grease samples taken at various points on the River all fell below 5 mg/L. According the US EPA, allowable limits of oil and grease in typical treatment plant discharge is 15 mg/L. The draft NPDES permit for the MWRA's CSOs and outfall pipe does not allow any oil and grease discharge. Based on this information, Pipe 1 has high levels of oil and grease and Pipe 2 has very high levels of oil and grease.

Lead: The water quality standards for lead in fresh water are 3.2 ppb chronic/83 ppb acute. Based on these criterion, the EPA has developed some benchmark values for levels of stormwater discharge. For lead, the benchmark value is 82 ppb. Based on these values, none of effluent from the four pipes tested have abnormally high levels of lead.

Copper: The benchmark value for copper levels in stormwater discharge is 64 ppb. Based on this value, only Pipe 2 has high levels of lead.

NEXT STEPS:

- Working with Team 1, send these results to the City of Medford. Offer to help work with the City (including additional lab analyses) to investigate Pipe 1 for potential illegal connection.
- Working with Team 2, send these results to the City of Somerville (Thom Donahue) to inform them of high oil and grease levels at Pipe 2. Also inform the City of the "surge" volunteers experienced during sampling. It is possible this surge was from an illegal sewage connection, a "clean cooling liquid" discharge, of possibly a blockage in the pipe.
- Working with Team 3, send these results to the Town of Belmont (Donna Moltrup, Tom Gatzunis, and John Murphy). Offer to help work with the Town (including additional lab analyses) to investigate Pipe 4 potential illegal connection.
- Send copies of all correspondence with Cities and Towns to the US EPA (Carol Tucker/Ken Moraff) and MA DEP.

- Get dry weather samples from both Pipe 1 and Pipe 4 to test for fecal coliform.
- During next rain event , additional fecal coliform samples from Pipes 1, 3 and 4. Also collect samples of the receiving water 100 yards down stream.
- During next rain event, collect samples from Pipes 2 for analysis of PAH levels in the discharge (approximately \$210 each).
- Target the NAPCO kit (which includes detergent tests) for Pipe 2 during the next sampling event.
- Get accurate Total Dissolved Solids and pH readings from all pipes, but especially Pipe 2. High metal levels in discharge can often correlate with high levels of solids. If that is true, preventing particulate matter from entering stormwater can significantly reduce metals loadings to the receiving water.



Save the Harbor Save the Bay

Founded 1986

MEMORANDUM

To: Storm Drain Detectives
From: Jodi Sugerman, Policy Director
Date: July 9, 1997
Re: STORM DRAIN DETECTIVE SAMPLE RESULTS

Attached is a matrix of the most recent Storm Drain Detective results for the Mystic/Alewife area. We received the last results (PAHs from Citizens Laboratory) today. As you can see, we had some particularly interesting fecal coliform results from the wet weather testing on June 19. Pipes 1, 3 and 4 all tested extremely high. Samples were collected early in the morning prior to 7:00 am. Although it had rained all night, it was not raining when Detectives collected samples. As a result, the flow was reduced to a trickle at all of the pipes except Pipe 4 which is a culvert. It is possible that reduced flow may have had some impact on the bacteria results. I am checking into this idea. In the mean time, I would suggest that we collect dry weather samples at Pipes 1 and 3 as soon as possible. Team leaders can give me a call to arrange for this sampling.

Regarding Pipe 2, there were no PAHs detected in the sample. However, as you can see from the matrix, the level of oil & grease in samples collected 6/19 were close to half that of samples collected on 5/25. I have not yet received the data collection sheet from Team 2 for June 19 detailing the NAPCO kit results.

These sample results are being sent to local officials in Medford, Arlington and Somerville with copies to both the Department of Environmental Protection and the US EPA this week. I will also send copies to Team Leaders. Save the Harbor/Save the Bay is asking for further investigation (possibly for illegal connections on Pipes 1, 3, and 4) and is offering to help with lab services associated with the investigations. I will keep you all posted.

Thanks again for all of your hard work! Give me a call with any questions.

	Fecal* Coliform Discharge 5/25	Fecal Coliform Discharge 6/19	Fecal Coliform Downstream 6/19	Fecal Coliform Dry Weather Discharge 6/24	Fecal Coliform Dry Weather Downstream
PIPE 1:	40,000	600,000	58,000	N/A	N/A
PIPE2:	3,000	N/A	N/A	N/A	N/A
PIPE 3:	26,000	400,000	88,000	N/A	N/A
PIPE 4:	120,000	180,000	500,000	50,000	6,900
Note: All bacteria levels are in Fecal Coliform /100 ML					
	Oil & Grease 5/25	Copper 5/25	Lead 5/25	Oil & Grease 6/19	PAHs 6/19
PIPE 1:	21.4 ppm	24 ppb	17ppb	N/A	N/A
PIPE 2:	30.5 ppm	95 ppb	31 ppb	15.9 ppm	None Detected
PIPE 3:	None Detected	20 ppb	8 ppb	N/A	N/A
PIPE 4:	None Detected	33 ppb	8 ppb	N/A	N/A
	Discharge Temperature 6/19	pH 6/19	Dissolved Oxygen 6/19	Nitrates 6/19	Total Dissolved Solids 6/19
PIPE1:	N/A	6.2	8 ppm	1.0 ppm	40 ppm
* PIPE 2:					
PIPE 3:	17.5 degrees celcius	6.9	7.45 ppm	0.8 ppm	325 ppm
PIPE 4:	16 degrees celcius	7.1	8.2 ppm	0.35 ppm	135 ppm
* Team 2 used both the MWRA and the NAPCO kit during on 6/19, however results have not yet been received The NAPCO kit tests for Detergent, Phenols, Ammonia/Nitrogen, Copper, Chlorine, Color and Turbidity					

* Team 2 used both the MWRA and the NAPCO kit during on 6/19, however results have not yet been received at SHSB. The NAPCO kit tests for Detergent, Phenols, Ammonia/Nitrogen, Copper, Chlorine, Color and Turbidity.

DATA INTERPRETATION:

Below are some guidelines for understanding the attached data. For more information on temperature, pH, DO, Nitrates and Total Dissolved Solids, and the NAPCO kit parameters, consult your Volunteer Manual pages 4 - 6. Each team has also been given a copy of a Technical Memorandum completed by Metcalf & Eddy which is a survey of typical stormwater quality in the Boston area. Again, feel free to call me with any questions.

Fecal Coliform: Using several data sets, the MWRA did a review of fecal coliform levels in storm drain discharge between 1988 and 1992 and found the average to be about 38,000/100 mL. Using this information alone, it seems that fecal coliform levels in almost all of the samples taken (with the exception of Little Pond in Belmont) fall within the range of typical urban stormwater. However, there are many different factors affecting what is construed as "normal" bacteria levels in stormwater most important of which is the size of the drainage area. From areas less than 90 acres, levels are usually between 1,600 - 3,000/100 mL. For drainage areas greater than 150 acres levels range between 43,000 - 85,000 mL.

Oil and Grease: According to the Baseline Water Quality Assessment prepared by the MWRA (in order to inform their CSO plan), oil and grease samples taken at various points on the River all fell below 5 mg/L. According the US EPA, allowable limits of oil and grease in typical treatment plant discharge is 15 mg/L. The draft NPDES permit for the MWRA's CSOs and outfall pipe does not allow any oil and grease discharge. Based on this information, Pipe 1 has high levels of oil and grease and Pipe 2 has very high levels of oil and grease.

Lead: The water quality standards for lead in fresh water are 3.2 ppb chronic/83 ppb acute. Based on these criterion, the EPA has developed some benchmark values for levels of stormwater discharge. For lead, the benchmark value is 82 ppb. Based on these values, none of effluent from the four pipes tested have abnormally high levels of lead.

Copper: The benchmark value for copper levels in stormwater discharge is 64 ppb. Based on this value, only Pipe 2 has high levels of lead.

Appendix D

Mystic River Shoreline Management Plan: Management Issues and Recommendations

The following is an assessment of the issues relative to maintenance and management of the Mystic River shoreline, followed by recommendations to address them. Issues have been divided into those related to condition and maintenance of the property's vegetation (including treatment of the river's edge); those related to condition and maintenance of hard surfaces; and those related to use. The condition of structures has been assessed by visual inspection.

I. Site Vegetation and Riverfront

I.1. Grass Condition and Maintenance

Grass maintenance is the most labor-intensive maintenance task on the site, and occupies a disproportionate amount of maintenance hours. Most of the grass areas throughout the project site are maintained as mown lawn. Only one area was observed to have taller grass, in proximity to the playfields northwest of LoConte Rink. This is planted in rye, which gets very high (30") and browns out when it is mowed.

There are very few ecological systems that are more impoverished than lawn. In support of the objectives to enhance wildlife habitats and strengthen visual character, the property was assessed in terms of opportunities to convert lawn areas to meadows, thereby greatly increasing wildlife as well as aesthetic values.

An equally important objective is to reduce the time spent on grass mowing in order to reallocate the time saved to other tasks. The Ecological Management Plan in the Appendix details a series of alternatives to lawn and the benefits gained from them.

In order to forge an achievable course of action for the agency in embarking on this new grass management approach, these meadow zones can be phased in over time. There are three meadow types recommended in the ecological management plan, supportive of a variety of visual images, uses, and habitats. It is recommended that they be introduced one at a time, to be manageable for the MDC, with the rest of the grass area treated as they are currently.

Increase surveillance, particularly in wooded or remote areas, to stem the problem of inappropriate uses.

Support the development of citizen action committees, which were advocated for at one public meeting, as partners with the MDC for maintenance support as well as patrolling of places such as at Lower Mystic Lakes.

III.3. View Zones

For the majority of the shoreline, there are fairly clear views into the river. There are high-use areas along which views to the river should be maintained. The management maps identify those areas, either by zoning of grassland areas or by a symbol indicating particular places where views are desirable.

Areas where more visual screening/separation is desirable are where busy adjacent roads intrude into the serenity of the shoreline. This need should be balanced with provision of strategic views in for motorists.

Recommendations for View Zones

Maintain or establish screening vegetation along some stretches of busy roads to protect the serenity of the parkland.

Maintain open views into the river at the following locations:

- at the Lower Mystic Lake;
- at the High Street bridge/Hobo Flats;
- at the lawn area near the bandshell;
- at bridges where street intersections provide opportunities for views in;
- at McDonald Park;
- adjacent to the neighborhood along Mystic River Road.

There were two areas cited as problem areas at one time or another: Hobo Flats by the High Street bridge, and the area by the Lower Mystic Lakes.

Hobo Flats, an open area at the High Street bridge, has a long history of use. It has been recently frequented by a younger and more rowdy group who use the space for drug use, drinking and fighting. Up until recently, it had been used by an older group of relatively law-abiding people. Apparently in response to this, the table and chairs that were at the site have been removed by the police.

A prostitution ring has operated at the area by the Lower Lakes where the lake meets the river, apparently for years according to one citizen. The neighborhood spearheaded a major cleanup last fall (drug paraphernalia, mattresses, pornographic material, old furniture found). The community has worked with the MDC and Medford police to eliminate the problem.

This area of the park is one of the only places where there is forest cover, with a diversity of vegetative layers present. There are citizens who identify the vegetation as the source of the use problem, and asked that it be removed. Unfortunately, this type of response usually results in an entire vegetation age class being destroyed, such as saplings which represent the next generation of trees.

There are also suspected illegal activities in the area of the phragmites at McDonald Park.

Recommendations for Inappropriate Uses

Use trash barrels with dome lids to prevent dumping of residential trash.

Consider the use of trash barrels year-round to reduce litter.

Maintain the forest zone at the Lower Mystic Lakes area, to protect this important ecological zone for wildlife as well as appropriate human use and enjoyment. Trim/prune vegetation periodically (trees according to ~~pruning schedule above~~).

III. Use

III.1 Appropriate Uses

The two public meetings, as well as subsequent conversations with residents, yielded much information concerning use of the Mystic River shoreline. There is a great deal of active and passive use of the shoreline, including walking, jogging, rollerblading, biking, dog walking, fishing, birdwatching, boat launching, sitting, meditating, picnicking, etc.

One of the most striking outcomes of the public meetings was the importance of wildlife, the natural landscape, and the ecological health of the property to the great majority of people who participated. While it is clear that there is a great deal of active recreation, both structure and unstructured, that occurs within the park, the overwhelming concern expressed was for protection and enhancement of the natural environment.

There was not an expressed conflict between active and passive uses of the property. The recreational fields on the property are leased from the MDC by the City of Medford, and are maintained by the city.

Recommendations for Appropriate Uses

Implement differential mowing of grass to support habitat enhancement as well as use of areas for recreational activities, maintaining popular use areas in lawn.

Keep the areas around headwalls unvegetated to allow for maintenance of these structures as well as view windows canoe launching from these locations.

III.2 Inappropriate Uses

Inappropriate or problem uses were also cited by the public: prostitution, dumping of trash, pool siphoning, road drainage, drinking and drugs.

II.3. Condition and Maintenance of Structures

Storm Drainage. The areas around the storm drainage pipe outfalls were observed as eroding. Several concrete headwalls are in disrepair from erosion to the extent that the structure has become freestanding; some structures have fallen over into the water. At other locations, tree roots have penetrated and surrounded the pipe, heaving it out of alignment. Fans of underwater sediment deposition were observed at each outfall.

Bandshell. The bandshell is in good condition, having been recently renovated.

Reservation Structures: Lookout tower, bridges over streams, dock. These structures all appear to be in good condition.

Fencing. There is a section of fencing along the shoreline at Dugger Park which is rusted.

Recommendations for Structures Maintenance

Implement a regular maintenance schedule for park structures.

Conduct an engineering study to determine the extent of necessary remedial work to the stormdrain structures. Once structures are repaired, follow a regular maintenance program to keep them in good condition.

Maintain the storm drains by removing sand, grit, oil and grease. Long-term, conduct secondary or tertiary treatment at storm-drain locations. Make specific recommendations relative to this a component of the scope of an engineering study.

There is bituminous concrete path at Hormel Stadium, and at the bandshell and little league fields. There is graffiti on some of the pathway at Hormel, and the vehicular access way to the little league fields is in poor condition, with bituminous concrete pavement cracking up. These recreational areas are maintained by the City of Medford, and leased from the MDC.

Recommendations for Path Maintenance

Power wash graffiti off the pathway at Hormel Stadium.

When poplars are replaced at McDonald Park, excavate tree roots and repair sidewalk.

II.2 Road Condition and Maintenance

There is an area known as Hobo Flats, south of the High Street bridge on Mystic River Road, which has historically been used as a gathering place. The parkland nearby is also a popular picnic spot. From this area to Dugger Park, the road lacks curbing, allowing people to park on the grass at the road edge when using these areas. The road edge is in poor condition as a result, as well as the grass edge along the road which has been compacted and damaged.

There is a maintenance road leading northward from the playfields by Hormel Stadium towards the marina and Medford center. There is vegetation encroaching on the roadway to such an extent that vehicles have been forced to drive with one wheel on the pavement and one wheel on the grass.

Recommendations for Road Condition and Maintenance

Clear encroaching vegetation back to the edge of the pavement. Maintain a pruning schedule to keep it off the road.

Implement a design solution to prevent off-road parking of vehicles at Mystic River Road, such as curbing of the road and organization of a small parking area.

Explore the use of chemical controls (the product known as "Rodeo" and others, "Roundup" and "Vision"). This has been shown to be an effective method, although there has been controversy about environmental impacts. Toxicity tests indicated that it is virtually non-toxic to all aquatic animals tested.

Contact other organizations who have been dealing with the problem, such as the Boston Parks and Recreation Department, the National Park Service and the Nature Conservancy.

For species other than the major stand of phragmites, root out invasive species where they are observed, planting alternative vegetation using the list of Recommended Native Wildflowers, Shrubs and Vines in the Appendix.

II. Circulation and Structures

II.1. Path Condition and Maintenance

Over the majority of the site, the path system consists of a dirt way of varying width. This appears to be sufficient for the uses put to it: walking, jogging, dog walking. It is sufficient for mountain bicycling, but not for bicycle touring. It is outside the scope of this study, but it appears that there are places where the provision for both a walking and a bike path is feasible, and others where it is not. The issue of increased use by bicyclists and the possible conflict with wildlife habitat should be considered. The group Bike to the Sea advocated for a continuous paved bike trail throughout this site, and ultimately connecting to the coast.

There is a bituminous concrete path system throughout the Mystic River Reservation/McDonald Park, as well as a paved path under Route 16 that feeds into the reservation. In general, the path is in good condition except for some specific areas. There has been heaving of pavement due to the poplar tree roots. There is also a mat of phragmites roots encroaching onto the pavement where that invasive species has taken hold.

1.4. Control of Invasive Species

Invasive species are a maintenance problem as well as a threat to the diversity of the resource. The Mystic River is experiencing the problem that plagues many other watercourses here and throughout the country. Phragmites is by far the major problem species, particularly at the Mystic River Reservation/McDonald Park. There have been numerous studies and experiments focused on controlling phragmites through a variety of mechanical, biological and chemical methods. There is an article on phragmites control included in the Appendix. It was published in 1989 by the U.S. Department of the Interior, Fish and Wildlife Service.

The phragmites at McDonald Park have a long history of entrenchment on the site. When the park was being designed in the 1970s, soil samples taken twenty feet deep revealed phragmites contamination. The species is a symptom of the larger problem of water quality, which must be addressed in conjunction with any vegetation control methods.

There are other invasive species that have become a problem in places along the Mystic River shoreline. Polyganum was observed as making a start by the little league fields. Bittersweet is another invasive species that was observed. Rosa multiflora, also present, is spread by birds. Bamboo (*Sasa* sp.), observed in some areas, will spread as well. The Ecological Management Plan in the Appendix has a comprehensive list of invasive species.

Recommendations for Control of Invasive Species

A comprehensive plan for the control of invasive species is beyond the scope of this study. The following potential approaches, however, should be investigated:

Mow the reeds back four to five feet where they have intensively colonized at McDonald Park, maintaining that wider open swath and expanding it over time. Mowing has been shown to be an effective control on other sites, for example with Polyganum in the Emerald Necklace in Boston.

In ecological terms the ideal width of a vegetated shoreline strip is a minimum of 25 feet, in order to provide sufficient security for birds to linger, safe from predators and people. There are places where this will be possible, and others where it will not. The vegetated strip on the maps is of varying width determined by available space and use of the area.

Native species better support the character of the shoreline, are self-sustaining, and require less maintenance. Well adapted to the area, they do not need spray or feeding programs and they can weather the winter. Some areas have good distribution of native species, including species such as amelanchier and alder.

It appears that the major cause of bank edge erosion is wakes from passing boats. There are areas of shoreline edge that have been stabilized with the use of riprap, and others that have not been stabilized. While riprap use stabilizes the shoreline edge, it also changes its visual character and limits plant growth. Fiber roll, a bio-engineering technique, has been used in places along the Mystic River shoreline to attempt bank stabilization while allowing for vegetation growth. Fiber roll is composed of plant fibers rolled up and bound together in long rolls that are staked in place. Where it was observed, however, it appeared to have too small a diameter to be effective.

Recommendations for Shore Edge Maintenance

Phase in the planting of the river edge within the zones indicated on the map, maintaining open areas where indicated for views and river access. Favor the use of native species when building up the vegetated riverfront edge.

Explore bio-engineering techniques such as fiber roll to stabilize the shore edge, ensuring that it is of sufficient size to resist erosion and allow plant growth. See Illustrative Sections in the Appendix for an illustration of this recommendation.

Year One: Mystic Lakes to Boston Avenue
Year Two: Boston Avenue to Main Street
Year Three: Main Street to LoConte Rink
Year Four: LoConte Rink to the MBTA Bridge

Follow this four-year cycle to maintain the trees that are found in the following three landscape zones as follows:

Forest Zone: very little intervention except for trimming of dead limbs on mature trees and selective thinning of saplings to encourage healthy growth of the next generation of trees and a multi-aged stand.

Shore Edge Zone: pruning of mature trees for proper form and to remove dead, dying or diseased wood, and thinning anywhere that the density of saplings is suppressing good secondary growth.

Mown Lawn with Tree Canopy Zone: regular pruning for proper form and to remove dead, dying or diseased wood.

1.3. Condition and Maintenance of Shore Edge

The Ecological Management Plan in the Appendix discusses the dynamics of the Mystic River bank and its resources for wildlife. This is an important transitional area of the property, and should be managed for wildlife habitat as well as human use.

Many stretches of the riverfront at present are devoid of understory vegetation. In addition to the lost opportunity for habitat value, this zone also presents a maintenance problem, and in many places appears as a barren compacted zone with exposed tree roots. While the addition of native vegetation will require increased maintenance in the near term, the stabilized and self-sustaining banks will ultimately require very little maintenance, appear more visually appealing, and greatly enhance the environment for wildlife.

The maps indicate areas to be vegetated and areas to remain open, based on the need for views, river access, and habitat enhancement.

Elms on the bridge embankment near Mystic River Reservation/McDonald Park. Trees have been planted too low, and they are dying as a result.

The poplars in McDonald Park were intended to be temporary trees, and need to be replaced with longer-lived species.

There are several zones of tree cover: the forest zone (limited areas at present) where there are multiple layers and ages of vegetation; the shore edge zone where mature trees and saplings grow in association with shrubs and herbaceous materials; and the zone of mown lawn with tree canopy. At present, the Forestry Division of the MDC does not do regular pruning work, but responds when there are immediate needs, such as dead limbs which represent safety hazards.

There is a need, however, for proactive, regular pruning along the parkland, beyond what the agency can accommodate. There is evidence of bad or neglected pruning in places throughout the property. The three zones with tree cover require different levels of intervention, outlined below in Recommendations. Each zone should be maintained during the four-year cycle listed below, for which the shoreline has been subdivided into quadrants.

Recommendations for Tree Maintenance

Maintain a meadow zone around the base of trees and rows of trees, in order to facilitate grass maintenance and avoid mower damage. See Illustrative Sections in Appendix for an illustration of this recommendation.

Lift elms up on bridge embankment where they have been planted low, or re-grade around them.

Interplant oaks within the poplars in McDonald Park, to replace them when the poplars die.

Contract with an arborist to implement a four-year pruning cycle, according to the following geographic subdivisions:

In general, the property's grass is in good health. However, the grass is not of fine, lawn-type quality. There are indications that the mowers being used on the property have dull blades. Ragged grass blade ends were observed in a number of places.

Recommendations for Grass Maintenance

Implement differential zoning of acreage presently covered by grass, based on use, visual character, and opportunity for wildlife habitat enhancement. (see Ecological Management Plan, below, for details on establishment of various meadow systems. See maps for proposed delineation of zones.) The second meadow type, Springtime Wildflower Meadow, is recommended for initial implementation. It promotes a variety of wildflowers while allowing groundcover short enough for multiple use.

Define a consistent mown edge along the pathway system by running the mower down the middle of the pathway. See Illustrative Sections in the Appendix for an illustration of this recommendation.

Install structures such as posts or bollards at intervals along the boundary between meadow management zones and lawn in order to delineate differential mowing regimes for the maintenance staff and to indicate to the public that this treatment is intentional. Consider the strategic placement of simple signs indicating the purposes of the management approach.

1.2. Tree Condition and Maintenance

The species diversity of the site's trees is quite good, with the exception that there is a relative lack of conifers.

Some trees have been damaged by mowers. In general, however, the majority of the tree population is in fairly good condition. There are several notable exceptions:

Appendix E

*Alewife Ecology Guide: Habitat Needs; Stewardship; Natural History
and Development*

Habitat Needs

The following sections review some of the requirements for maintaining healthy wildlife habitats at Alewife and also some of the factors that have contributed to habitat decline.

4-1 Herring of Mystic River Waterways

The following information comes from Jordan and Evermann, *American Food and Game Fishes*; John Hay, *The Run*; Bigelow and Schroeder, *Fishes of the Gulf Coast of Maine*; Michael J. Ursin, *A Guide to Fishes of the Temperate Atlantic Coast*; and Stewart Sanders' field notes:

Alewife (Branch Herring) *Pomolobus pseudoharengus*

LOCATION: Atlantic coast from Carolinas northward, small lakes in New York tributary to the St. Lawrence and in Lake Ontario.
APPEARANCE: Large eye, well forward, lower jaw extends beyond upper; single dark spot behind operculum.

Blueback Herring (Glut Herring, Summer Herring) *Pomolobus aestivalis*

LOCATION: Atlantic coast from New England to Carolinas; is less abundant northward than the alewife and appears in streams somewhat later; seem to prefer smaller tributaries.

Spawning Activity

Water temperature for spawning may be about 55-60° F. Eggs are .05 inch; .90 mm unfertilized; 1.25mm after fertilization; milky white to clear. Eggs hatch in 6 days in 60°F water; 3 days or less in 72° F water. Larvae are 3.5 to 6 mm. Carp eat the eggs and the young for 3-6 days.

Dates of the Herring Run in the Mystic River Watershed

Herring can be viewed swimming upstream at the Amelia Earhart Dam from the Somerville side from mid-April through May. Dam personnel (phone 666-3338) reported a decline in herring for 1992 and 1993 as compared with the 1980's.

- The spawning areas for eggs and young are:
- Mystic Lakes Dam and Lower Mystic Lake in Medford and Arlington
 - Mouth of Mill Brook, Arlington (formerly reaching Cook's Hollow)
 - Winn Brook culvert, Little Pond, Belmont
 - Spy Pond outlet pipe, Little Pond (some years)
 - Wellington Brook at Claypit Pond, Belmont (one year in five)
 - Two streams flowing from West Medford, at the banks of Mystic River (until recently).

Along Alewife Brook, until about 1840 when Fresh Pond stopped overflowing at the Brook's source, hundreds to thousands of herring could be seen in April and May. The following is a chart of chronological observations of herring in recent years by Stewart Sanders as recorded in his field notes from the late 1970's to 1994:

Table 4-1
Herring Observations by S. Sanders 1977 to 1994

DATE	LOCATION	S. SANDERS' FIELD NOTES
April 26, 1977	Lower Mystic Lake	"Some arrived"
October 8, 1977	Little & Spy Ponds	"Many small fish at Winn Brook and Spy Pond culverts, about two inches long, swimming up current"
June 5, 1978	Little Pond, Mystic River	"Little Pond many; in stream near Auburn St., Medford, many; many along Somerville shore by MDC boathouse."
May 9, 1979	Lower Mystic Lake & Little Pond	"Many at Mystic Lake Dam; a few at Winn Brook culvert/Little Pond. I showed children how to convey to Upper Mystic Lake; asked them to remove barbs from hooks; use single hooks; youth took 50 fish for lobster bait."
August, 1980	Alewife Brook	"Three fingerlings gaping and flipping on top of polluted water just upstream of Henderson St. bridge, Alewife Brook."

Table 4-1
Herring Observations(cont'd)

DATE	LOCATION	S. SANDERS' FIELD NOTES
May 5, 1982	Mystic Lake & Little Pond	"Fish at Mystic Lake Dam and Little Pond."
May 7, 1983	Mystic Lakes Dam	"Fish are here."
May 6, 1984	Little Pond	"None."
May 5, 1985	Mystic Lakes Dam	"Barrel loads being taken."
May 20, 1985	Upper Mystic Lake	"Weeds and algae ahead of schedule."
April 28, 1991	Mystic Lakes Dam	"7-8 inch fish in fast water below dam. Gulls take them easily. People are fenced out: 'no fishing' sign."
May 25-26, 1993	Winn Brook culvert at Little Pond	"Many reported."
May 23, 1994	Mystic Lakes Dam	"Many. Two people putting net-falls to Upper Lake across top of dam. They report large taking by many people here yesterday. Fish sometimes get caught in dam on return. U.S. Marine Fisheries requested by S. Sanders to design fishway."
	Mouth of Mill Brook	"Some herring have arrived but 18" dam will block passage unless we cut slot and build small wooden passage."
May 25, 1994	Little Pond	"8-12 inch alewives identified by color of intestine lining. 25-50 at Winn Brook culvert and 1 large carp."
May 30, 1994	Mouth of Mill Brook	"Many at little dam. Dave White plans to put some over. Small fishway being built by S. Sanders"

Natural historian William Brewster wrote of Native Americans and the early Irish settlers in this region who depended on the plentiful supply of herring in Alewife Brook for food. "Through it (Alewife Brook), the migratory fish from which it takes its name still passed and repassed on their way to and from the sea. In April and May, when they were running up the brook, very many of them were caught by the Irish (who had only recently settled in the neighborhood) with dip nets or in rude weirs, and I have seen two or three hundred taken at a single cast of a small seine. They spawned in Fresh Pond, where their fry literally swarmed in autumn, attracting numbers of fish-eating birds and supplying abundant food for the numerous pickerel and other predatory fishes."

Some vestiges of that hunter-gatherer culture still exists today in this area. Russian immigrants can be found taking herring at Wellington Brook and Southeast Asians catch them at Mystic Lakes Dam in the spring. For these people, the herring is still viewed as temporary sustenance on which they depend to meet a basic need. However, because of the decline in water quality in the Mystic River watershed due to development, the introduction of carp into its waters, the building of Amelia Earhart Dam, and debris and other obstructions to fish passage, conditions have worsened for healthy fish runs in Alewife Brook. Therefore, it is important to maintain a balance in taking fish while at the same time working to improve conditions for the herring.

From a broader perspective, the collapse of the George's Bank fishing and the increasing restrictions being placed on the commercial fishing industry in New England may signal an historical turning point. Whereas, until recently, the availability of free-swimming fish was virtually unlimited, we are now becoming more dependent on farm fish.

The early history of Alewives in these waters is found in William Wood's *New England Prospect*, 1634, and William Brewster's *Birds Of the Cambridge Region*, 1906.

4-2 Fish and Wildlife Evaluation

Fish and wildlife at Alewife have a variety of habitat needs that must be met to maintain healthy populations. The Alewife, especially over the last fifty years, has become an enclave or sanctuary for natural communities in the predominantly urban landscape. The following rating scale and table should help you to understand these creatures' needs and present habitat conditions.

Habitat rating scale for the following table:

10-Productive Breeding	5- some nourishment, fattening up for migration; regular feeding visits
9-breeding maintains population	4-subsistence for shorter visits; useful for resting and feeding
8-breeding at net losses	3-meets some needs for short visits
7-courtship or territorial activity	2-undesirable
6-sustains for weeks or months	1-dangerous, losses likely

Table 4-2
Evaluation of Fish and Wildlife

SPECIES/ STATUS	FOOD	PREDATOR	HABITAT NEEDS	HABITAT RATING
Alewife (Herring)	no food consumed during"run"	carp, gulls, cormorants, night herons	moving water, dissolved oxygen	Past: 10 Present: 3-9 Potential:8-9
Black Duck: Declining due to cross-breeding with mallards	pondweed bulrush			Present: 3
Cottontail	grass, clover, young sumac, crab apple trees	dogs and cats; red-tailed hawk	Brush piles for dens, briar patch	Present: 9

Table 4-2(cont'd)
Evaluation of Fish and Wildlife

SPECIES/ STATUS	FOOD	PREDATOR	HABITAT NEEDS	HABITAT RATING
Goldfinch/ Song Sparrow: Development increases parasitism by cowbirds	thistle seeds, weed seeds	dogs and cats destroy eggs/young	thickets & shrubs (People create paths near nests, followed by cats and dogs)	Present:10 Potential:8
Great Horned Owl/Red-tailed Hawk	young skunks, mice, birds, rabbits, pheasant & meadow mice		Woods >10 acres with some evergreens; Range: 4 sq. mi. seasonal; 2 sq. mi. daily	Present:4-6
Hérons, Black-crowned Night	frogs, mice, rats, non-game fish		in maple trees or on low branches/ here for summer	Past:10 Present:7 Potential:8
-Green	small fish, crayfish, aquatic insects		outer branches/ spring & fall migrations	Present:3 Potential:9
-Great Blue	non-game fish,insects, crustaceans, shrews,mice frogs,snake & turtles		edge of water, in trees/ late summer to early winter	Present:6

Table 4-2 (cont'd)
Evaluation of Fish and Wildlife

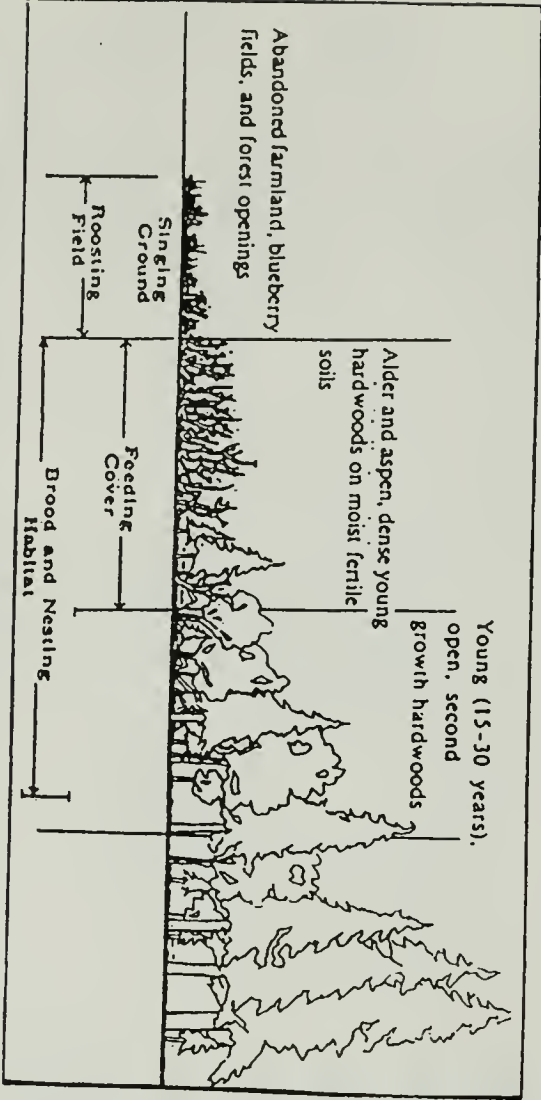
SPECIES/ STATUS	FOOD	PREDATOR	HABITAT NEEDS	HABITAT RATING
Killdeer	insects, especially beetles, caterpillars, ants, grass- hoppers	cats, dogs	fields; edges of air strips or golf courses	Present: 9
King- fisher	small fish, tadpoles, mussels, frogs, small snakes and turtles, grass- hoppers, moths, butterflies, beetles, aq- uatic insects young birds, mice, berries		sandy clay or gravel bank of pond or creek; nest hole at least 3 ft. from top of bank.	Past: 8 Present: 6/7 Potential: 9
Kestrel (small falcon), Screech Owl: Kestrel declining in numbers every- where; providing nesting sites & improving habitat may help	grasshoppers & mice		tall grass, weedy patches to produce seed & hab- itat for voles. Let some mowed lawn between pond & apts. grow up and cut back woods	Past: 10 Present: 4 Potential: 7

Table 4-2(cont'd)
Evaluation of Fish and Wildlife

SPECIES/ STATUS	FOOD	PREDATOR	HABITAT NEEDS	HABITAT RATING
Muskkrat: Probably present at Blair Pond & on ponds up/down stream	roots, leaves, and stems including cattails, bulrushes, arrow- head, and pondweed	snakes, owls, hawks, weasels, raccoons & people	still or slow- ly moving water with vegetation in the water & along the banks	Past: 10 Present: 9 Potential: 9 (or 5)
Pickereel	insects, fish		shallow water with abundant vegetation, shoal areas of plant growth over mud bottom; summer water temp. 70-90° F; pH: 6-9; DO: 3 ppm; CO2<40 ppm	Past: 10 Present: 1 Potential: 4
Skunk: Known to be in Blair Pond area; 3 signals before spraying: thumps feet; turns & faces rear end; raises tail	adult/larva insects, grasshop- pers, grubs, beetles, wasps, spiders, toads, mice turtle, eggs, grape, blueberry, cherry		summer range is .5 to 1 mile from den at night; male more active than female in winter: 6 to 8 times summer range	Past: 10 Present: 2 Potential: 4

Table 4-2(cont'd)
Evaluation of Fish and Wildlife

SPECIES/ STATUS	FOOD	PREDATOR	HABITAT NEEDS	HABITAT RATING
Woodcock	worms	cats	1) alders & birch, 15 to 30 yrs. old 2) 10 or more acres of open meadow 3) low damp lands	Past: 10 Present: 7 Potential: 8



The stages of forest succession used by woodcock
(University of Maine Life Sciences and Agricultural Department, 1981)

For Our Stewardship

This chapter presents action plans in the areas of habitat protection, water quality, and land uses designed to halt the decline of, and lead to improvements in, the Alewife ecosystem.

5-1 Improving Wildlife Habitats

Pheasants nest on the ground; cottontail and meadow mice feed and hide in the grass and thickets; the latter, especially with prickers, offer protection from dogs, cats and motor bikers.

There are many actions that can be taken in the Alewife area to strike a balance between the needs of the human species and natural communities. Any actions to support wildlife must be based on an understanding of the needs of these creatures. The following table lists some of these actions and potential benefits:

Table 5-1
Actions to Support Wildlife

ACTIONS INVOLVING PEOPLE	POTENTIAL RESULTS
1. Spray cat or dog.	Helps solve overpopulation of domestic animal.
2. Negotiate plan with trail bikers whose riding is making some trails used by people.	Minimizes access of predators to habitats.
3. Set limits and guidelines as to number of visitors and acceptable behavior.	Minimizes disturbance to creatures visiting, nesting or living there.
4. Get to know people who visit the area by acting as volunteer greeters.	Develops better understanding and sensitivity to creatures' needs.
5. Watch for "midnight dumping."	Reduces trash problem and habitat destruction.
6. Kill and take home some of the carp you catch.	Carp may be limiting other fish reproduction by stirring up mud.
7. Study conditions for return of pickerel. Report findings of any herring eggs or young to Mass. Div. of Marine Fisheries, 100 Cambridge St., Boston, MA 02202 (727-0394).	Enables State officials to develop and improve plans to support habitat needs of fish populations.

Table 5-1(cont'd)
Actions to Support Wildlife

ACTIONS INVOLVING LAND	RESULTS
1. Leave brush and thickets in place; don't remove.	Maintains bird and rabbit habitats.
2. Work with others to revitalize parts of the marsh that have been filled in and reestablish ponds and islands.	Would lead to improved water quality and healthier fish populations.
3. Make a green connecting link with Fresh Pond.	Increases habitat size needed by snakes and some other species.
4. Open the top of the outlet pipe from Claypit Pond to allow returning herring a route out.	Improves spawning of <i>herring</i> and leads to increased populations.
5. Make fish passage possible between Spy Pond and Little Pond.	Improves spawning of <i>herring</i> and leads to healthier populations.
6. Construct a dirt pile at water's edge to make nesting habitat for <i>kingfishers</i> .	Maintains bird habitats.
7. Clear some woods to allow new growth of <i>birch</i> and <i>aspen</i> .	<i>Woodcock</i> need abandoned farmland, blueberry fields, and forest openings for singing grounds.
8. Cut and clear away phragmites and knotweed.	May reduce filling of wetland with biomass and enhance biodiversity.

5-2 Improving Water Quality

The long-run survival of all life is dependent on good water quality. The Alewife is a microcosm of the wider world in terms of the degradation of its waters by overdevelopment. The major causes of Alewife's poor water quality are urban runoff, sewerage contamination, overpopulation, disturbed banks and erosion, and nutrient-caused growth. For detailed information about water quality, *eutrophication* and *silt*, see *Little River/Alewife Brook Survey, 1988, Sampling Data and Analysis*, Division of Water Pollution Control. The Mystic River Watershed Association has a copy (489-3120). The following are the major water quality problems of Alewife's water bodies:

Urban Runoff

Oil, gasoline, salt, sand and less noticeable materials from brake linings and tires are washed into storm drains from streets and parking lots during rain storms; this form of pollution is known as *urban runoff* which is a serious problem in the Alewife. Car, bus, and truck design and maintenance need vigilance and improvement. People must stop dumping oil and paint into storm drains, and towns need to clean *catch basins*. Design *swales* to retain storm water and filter it before it arrives at the pond or river. Use the space (formerly the skating rink) by Lake Street to retain runoff from the Route 2 highway. Do what you can to retain stormwater on site and allow it to percolate into the ground.

Oil leaks in home heating systems send oil into the water table to pass into the brook when there is a rise in the table. Prevent leaks with home emergency shutoff valves.

Sand and *silt* may be controlled at the source by street sweeping and be retained by baffles and retention sedimentation basins. Wellington Brook's entrance to Blair Pond can be shaped to facilitate periodic silt removal. See page 233 and Section 7.0 of Main Report, Upper Mystic Lake Watershed Urban Runoff Project, Mass. DEQE, Oct. 1982.

Sewerage

Massachusetts Water Resources Authority (MWRA) has worked to reduce human waste discharges from *combined sewer overflows* (CSO's) into Alewife Brook, where sewer pipes were designed to discharge during wet weather when they are filled by storm water runoff. Increased storage capacity of storm water runoff at MWRA's new sewerage treatment plant at Deer Island will help. Other programs to reduce further CSO discharges, under study by MWRA, must be implemented to improve water quality and preserve habitats. During very heavy rains, due to flow in the Mystic, the stream flow in Alewife Brook often reverses.

Optimum Human Population

Urban congestion and overpopulation is a factor contributing to sewage contamination of waters. An optimum population level was surpassed in the United States in the 1950's.

Disturbed Banks, Erosion and Clay

Little River's banks are clay; much of the brown color comes from disturbed banks where highway builders dredged a new channel for Little River when Route 2 was built. *Carp* now work at the bottom and banks to get vegetation. Remove clay banks and integrate river edge with wetlands north of river bed, especially between Little Pond and Perch Pond.

Too Much Growth

Nutrients wash off lawns where people are using excess fertilizer; the nitrogen and phosphorus runoff stimulate algae growth. In the spring, matted material from the bottom breaks up and floats along the surface.

Water Quality Survey

The Little River-Alewife Brook Survey by the Commonwealth shows two major problems: (1) lack of sufficient *dissolved oxygen* (DO) and (2) very high *fecal coliform* bacteria levels.

Some of the important features of the natural and man-made environment that impact the water quality and quantity of Alewife's water bodies are listed in the following chart:

Table 5-2
Alewife Water Quality/ Quantity

TOPOGRAPHICAL FEATURE	WATER QUALITY/ QUANTITY IMPACT	PLAN/STUDY REFERENCE*
Aquifer recharge from rainfall & snow to groundwater	improves water quality	f
Runoff: - directly from streets & parking lots - via storm drains	degrades water quality & adds to flooding degrades water quality & adds to flooding	a, b, g a, b, g
Sewage(domestic)	degrades water quality	b, c, d, h, i, j
Wetlands	improves water quality & reduces flooding	e
Erosion	degrades water quality	d

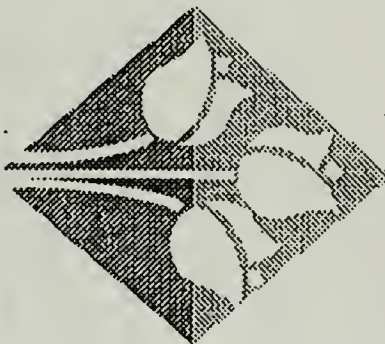
*Plan/Study References:

- a. Federal 208 Water Quality Study
- b. Spy Pond Restoration Study
- c. Little River/Alewife Brook Water Quality Study
- d. Blair Pond Study
- e. Wetland Restoration Plan for A.D. Little
- f. Mystic Watershed Hydrology Study
- g. Urban Runoff Report, Upper Mystic Lake
- h. MWRA CSO Report (Metcalf & Eddy) - Feb. 1994
- i. Town Infiltration/Inflow Studies
- j. MWRA CSO Facilities Plan

(Note: Studies are available in Mystic River Watershed Association's section in the library at Habitat Institute for the Environment at 10 Juniper Road, Belmont, MA and public libraries)

The following table shows the status for the studies and plans to improve water quality in the Mystic River watershed and Alewife:

Table 5-3
Studies/Plans to Improve Water
Quality in Mystic River Watershed

 PLAN/STUDY	P L A N S T A T U S	P E N D I N G A C T I O N	P A R T I A L L Y C O M P L E T E D	C O M P L E T E D	O N G O I N G
a) Federal 208 Water Quality	C				X
b) Spy Pond Restoration	C		X		
c) Little River/Alewife Brook Water Quality	C				X
d) Blair Pond - Preliminary - Master Plan	C 1995	X			
e) Wetland Restoration for ADL	C				
f) Mystic Watershed Hydrology	C		X		
g) Urban Runoff Report Upper Mystic Lake	C				X
h) Town Infiltration/ Inflow Studies	C			X	
i) MWRFA CSO Facilities Plan	12/94		X		

C = plan/study completed X = plan/study implementation status

5-3 Improving the Land

Cleanups

Picking up trash and preventing litter and "midnight dumping" are tangible ways to act as a steward of Alewife. Watch for evidence of who may have dumped and report any findings to the police. Most importantly, be watchful for your safety. These actions are important both for the direct benefits that accrue to the Alewife environment and for the positive impression and influence they may have on others.

In order to prevent inappropriate activities on public park land and to protect sensitive wetlands, any individual or group interested in undertaking a clean-up should call the MDC Community Relations Office, 727-5114 x 530. Any group larger than twenty-five people interested in visiting Alewife Reservation should also coordinate their activities through this office. The MDC works closely with the Mystic River Watershed Association (MRWA) and the Friends of Blair Pond (FOBP) in scheduling special activities and cleanups. MRWA has a map of MDC truck and trash pick-up locations. Hazards of clean-up work include the following:

- Broken glass and metal pieces in trash bags cut through the bag and cut skin.
- When reaching for debris, twigs between you and your objective sometimes go unnoticed and you may get a poke in the face.
- Poison ivy leaves an oil on the skin which can be removed as follows: as soon as possible but within 4 hours, wash thoroughly with a scrub brush and soap; put clothes in the wash and shoes in the sunshine to dry the oil.
- The banks of the Alewife Brook are very slippery; river and pond bottoms are very sticky with mud in places. Mystic River Watershed Association has special shoes called "mudders," as well as gloves, boots, and reaching devices; MDC supplies bags for trash.

Population

The following chart shows some approaches to balance species' numbers:

Table 5-4
How Some Species' Numbers Balance

SPECIES	FEW OFFSPRING	PREDATORS PRESENT	OUT OF BALANCE
song sparrow	X	X	
cotton-tail		X	
bass		X	
carp			X - a
Canada goose			X - b
domestic cats			X - c
people	some		X - d

- a - catch with bread or corn on fish hook, kill with blow to top of head; 1988 DEQE Water Quality Study samples show very small quantity of dangerous substance in flesh. Contaminants accumulate in fat tissue.
- b - Research ways to net, kill (in compliance with Mass. Hunting regulations), prepare for table and distribute to the needy.
- c - Spay cats; catch and remove feral individual.
- d - Court with beauty and ecological sensitivity; help others, especially siblings, to raise their young.

5-4 Active Groups

Some groups and individuals working to protect ecological values at Alewife are the Conservation Commissions of Arlington, Belmont and Cambridge, the Coalition for Alewife, Mystic River Watershed Association (MRWA), North Cambridge Stabilization Committee, East Arlington Good Neighbors, Cambridge Friends in Unity with Nature, Friends of Blair Pond (FOBP), state representatives and senators, and the Metropolitan District Commission (MDC) Planning Department (727-9693 X266).

Geology of Alewife

The Alewife area is right in the center of the scene where once some very dramatic events took place! Back in the old days--the REALLY old days--before there were any people in the world, you wouldn't have recognized the landscape around here. There wasn't any Fresh Pond or any Little Pond. There wasn't any Spy Pond in Arlington or any Mystic Lakes in Winchester. Instead, there was a long, deep valley coming down from the north.

The valley started in Wilmington, came down between Woburn and Stoneham, then right through Arlington Center. It went under Spy Pond and past Arthur D. Little Co.; then it crossed the Little River just north of Blair Pond. It went under the western part of Fresh Pond and finally came out into the old Charles River Valley near Mt. Auburn Hospital.

Back then, if you wanted to walk from where Belmont is now to the Harvard Square area, you would have had to walk down a steep slope--about one-hundred feet deep--cross a good-sized river, and climb back up again. This valley is still there in the bedrock, but during the last million years it was filled with silt and clay by the four continental glaciers that came down from Labrador. This clay furnished the raw material for one of Cambridge's biggest industries--the good red bricks you see in Back Bay homes, Boston office buildings, and Harvard dormitories. Jerry's Pond (near the T station) and Danahy Park are the sites of a couple of these old claypits.

If you dig a hole at the beach, the sidewalls start to cave-in when you get down to the wet sand. The clay does the same thing. The claypits--some of them more than 80 feet deep or below sea-level--endangered quarry workers because of the potential for cave-ins and collapses. A similar situation occurred when Perini Construction Company was digging out the clay for the Alewife

Subway Station in the early 1980's. They had to use an expensive, recently-developed technique called "slurry walls" to prevent the hole from caving in as fast as they dug it.

This filled-in bedrock valley is beneficial to towns above it. Water collects in the pores of the gravel in its bottom so that wells drilled into it provide good sources of water for these communities.

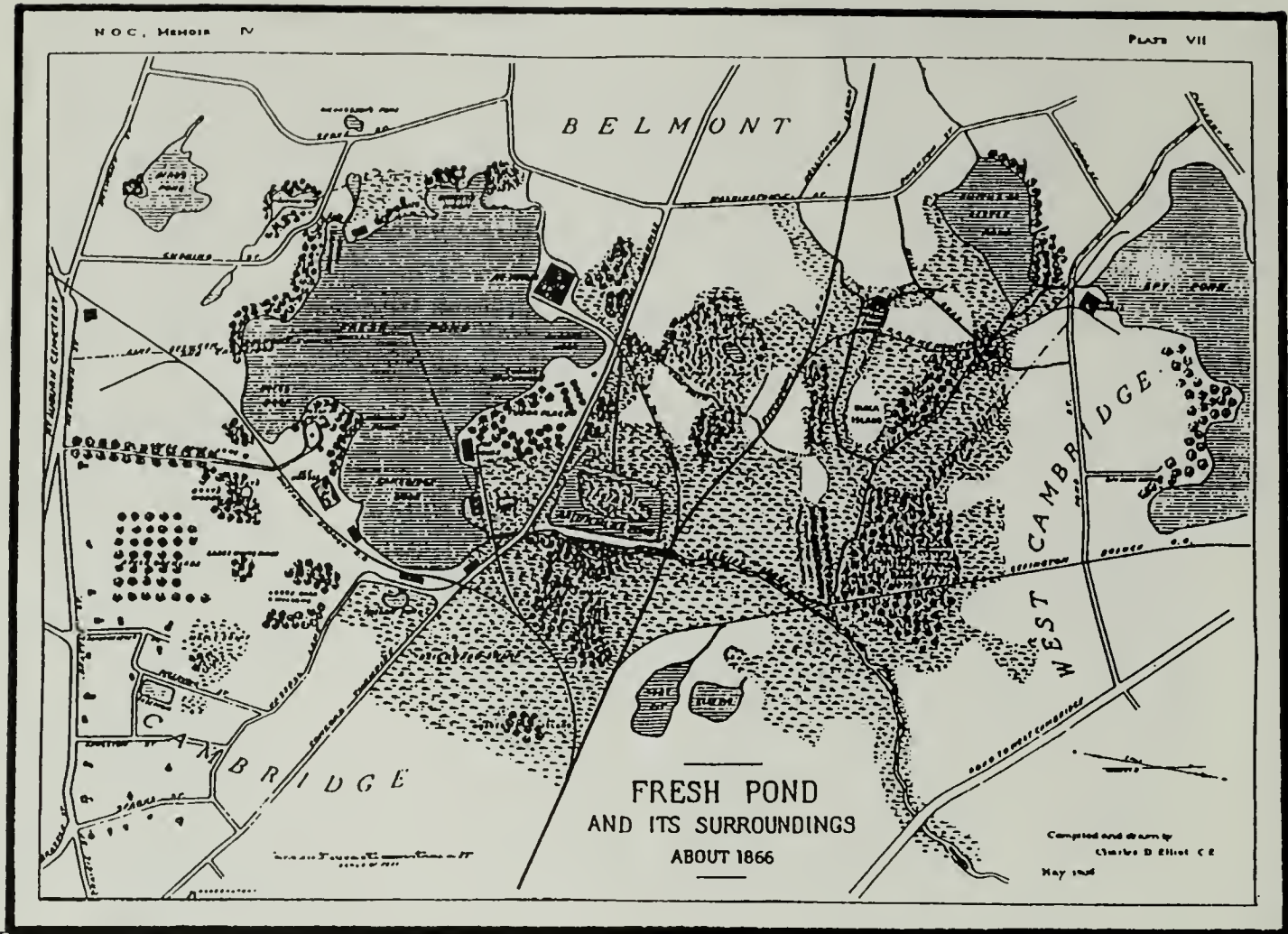
Natural History and Development

7

This section contains a condensed natural history of the Alewife area in Cambridge, Belmont and Arlington, and refers extensively to natural historian William Brewster's description of the Fresh Pond Swamps and Marshes.

The Early Years of Alewife presented here, before white men altered the area, are based on William Brewster's *Birds of the Cambridge Region* published in July 1906 by the Nuttall Ornithological Club. Observers on whom Brewster relied included his ancestors, botanist Thomas Nuttall, whose visits date from 1832, and the Cabot brothers who visited from 1842-1860 and canoed from Fresh Pond to Spy Pond. Brewster also used Charles Eliot's map (see next page) which appears in the volume. Brewster states that the marsh, "extending somewhat into Arlington and Belmont" contained "*reeds, bulrushes, wild rice and muskrats ... beautifully diversified by wooded or bushy swamps alternating with open grassy marshes ... two isolated round-top hills..., water good to drink, no pollution.*"

The Pine Swamp was a "primitive, beautiful wilderness" with white pines, oak, beach, yellow birch, thickets, young maples and gray birches. Water flowed from Fresh Pond through an outlet just west of the Fresh Pond rotary into Alewife Brook, which was a "*broad stream*" joined by Little River and lesser streams from the marsh extending to Spy Pond. Salt water sometimes flowed in from the ocean by way of the Mystic River. People caught 200-300 alewives and herring in a single cast of a net; these were running in April and May to spawn in Fresh Pond, where their "*fry swarmed in autumn.*" Hunters shot ducks, especially Ruddy Ducks on Fresh Pond and people killed herons for feathers and their eggs.



Natural History and Development

Mid-Late 1800's. In 1850 brick-makers dug out clay turning sections of the marsh into claypit ponds. Ice was cut from pond surfaces in winter and stored in sawdust in ice-houses. About 1855-1856 the pumping of water from Fresh Pond began to supply water for the city of Cambridge; the flow of Alewife Brook's upper section slowed and the brook's outlet from Fresh Pond to Concord Ave. was filled in 1870. There were "many pastures" until 1884. There were two or more separate swamps.

During 1876-84, there was extensive filling of lagoons; one of them had an island where herons had a nesting colony; heron nesting diminished and then came to an end. A slaughtering company was established and discharged its drainage into the marsh. Brewster writes there was an increase in cattails. Little Pond Conduit was constructed to convey additional water from Little Pond in Belmont for Cambridge's needs.

The Maple Swamp, nearly 50 acres, from Concord Ave. to the railroad consisted of "small grass meadows... clusters of willows, alders, viburnums, elderberry, maple saplings, and included two large islands." That was soon filled and buildings were constructed at the site.

Early 1900's At the turn of the twentieth century, after years of dumping garbage here, stagnant water caused Anopheles Mosquito breeding and outbreaks of malaria in many homes near the marsh in Arlington and Cambridge. Belmont's first cases triggered action in the State Legislature, and engineer John R. Freeman was engaged to study the marsh. Dumping had turned it into a series of stagnant pools, and consequently Freeman recommended changes. The conditions and recommendations are contained in the Freeman Report, which Herbert Meyer, Ph.D., of the Mystic River Watershed Association, recommended to Stewart Sanders.

The Metropolitan Parks Commission took control of the marshland, buying the land from the Hill family and others. Pools of stagnant water were drained. A dam was constructed on the Mystic River in Medford Center; it eliminated the influence of

tides and occasional intrusions of salt water. According to a 1910 *Medford Mercury* article reporting on the new dam, this would bring to an end the annual harvest of thousands of eels. To facilitate road and property development, Alewife Brook was channeled downstream of the marsh. Little River was filled in and another stream dredged, becoming what we now call Little River.

1940 to late 1960's The successful production of synthetic rubber at Dewey and Almy Co. was very important in the war effort. Residues were placed in lagoons near Jerry's Pond. After the end of World War II, more land was filled and more buildings and roads were constructed. The international consulting firm, Arthur D. Little Co., built roads, buildings and a parking area. Route 2 was widened in the late 1960's, and dirt and rock cut from the top of the hill was probably placed in the open area. What some youths called "muskrat mountain" was cleared, and the Hill Estate apartments and town houses were built on Hill Farm extending from Hill Crossing, the railroad crossing at Brighton Street, to Little Pond.

1972 to 1984 (*The following information comes from Stew Sanders' field notes based on his many trips on foot, skis, skates and especially canoe, usually with a small group of visitors. Most complete bird studies are by Lee Taylor. Mr. Wright of the Arlington Natural Resources Department, Mr. Dixon of the Mass. Division of Fisheries and Wildlife, and knowledgeable teachers and naturalists pointed out flora and fauna.*)

From 1973, the plant life includes a few very large willows along the waterways, groves of maples with one very large one, groves of aspen and some birch, alder, staghorn sumac, thickets of blackberry, phragmites, cattails, wild cucumber, tansy, goldenrod, poison ivy, arrowhead and pickerelweed, some water chestnut, and duck weed. In the 70's there was some shooting and trapping of birds, rabbits and muskrats. One sunny day, three or four boys skipped school, caught a rabbit, and roasted it on a stick over an open fire. Occasionally, fires burn sections of grass and woods until the Belmont or Cambridge Fire Department brings them under control.

In the 1970's roofers and other small contractors regularly and secretly dumped truckloads of shingles and junk in several locations. The Mystic River Watershed Association, along with public and private agencies such as the Metropolitan District Commission, joined in a great clean-up removing truckloads of debris, shopping carts, tires and a car. Between 1976 and 1984, exactly one-hundred years after the destruction of the Pine Swamp, the Red Line subway extension came to Alewife along with a parking garage, access roads and many new buildings. Nine-tenths of an acre of land, between Hill Estates and Wellington Brook, was added to the reservation. The old railroad track was removed and a crushed stone bike and walking path opened from Alewife Station to Brighton Street on land that is now part of the MDC reservation. Herbert Meyer of the Mystic River Watershed Association insisted that this path not be paved.

1984 to 1993 During this time a homeless person sometimes lived in a hut made of construction materials and kept warm by a fire in an oil drum. Beer drinkers carry cases of cans and bottles into the woods and leave their empties. Arthur D. Little Co. took an aggressive role and caught and prosecuted a midnight dumper of construction and remodeling debris. He had to pick it up *by hand*-no machinery was allowed by the judge!

With a perfect attendance record and speaking firmly at public meetings, Herbert Meyer, as President of the Mystic River Watershed Association, initiated court action under the open space protection provisions of the Federal Highway Act.

Automobile traffic around the area increased steadily and cars clogged the streets of Arlington and Belmont; the Clean Air Act's limits on parking spaces, citizens' complaints and economic recession began to curb the ambitious development plans surrounding the open space. More urban runoff caused pollution, oil slicks and scum. Before heavy rainstorms, the water level of the Mystic River is lowered at Amelia Earhart Dam in Everett-Somerville to reduce flooding. These rainstorms can cause the Mystic River to flow into Alewife Brook reversing the flow

direction in the Brook. Combined sewers from Cambridge and Somerville continue to discharge untreated raw sewage especially during and after heavy rains and snow melt.

It is no longer possible to pole a canoe between Yates Pond and Little River. John Guillaume, who for two years spent his days on these waters picking up debris and relating to people, introduced Stew Sanders to that adventure about 1974. Due to concerns about flooding downstream, the water levels at Earhart Dam are maintained slightly lower now. There may have been some unintentional filling, but the other cause may be related to the amount of biomass that dies and grows back each year, filling in the wetland slowly. If this is happening, we cannot be very confident that the state wetlands laws, as implemented by conservation commissions, are sufficiently protecting these areas.

The state completed a study of water quality in Little River and Alewife Brook in 1988. The Metropolitan District Commission acquired the 7.1 acre Blair Pond parcel from Harvard University in 1991. The Mystic River Watershed Association, acting as the recipient for the Friends of Blair Pond, received a Riverways Program grant in 1993 for a preliminary study of the Blair Pond area. As a result of that grant, the MDC is about to develop a master plan to guide the reclamation and future management of this important new addition to the Alewife Reservation. A total of \$80,000 has been allocated by MDC for the plan of which about half will be used to implement some of the recommendations. The goal is to ensure the ecological integrity of the Blair Pond area as a wildlife habitat within the MDC property guidelines.

The 10.5-mile Minuteman Bikeway from Bedford to East Arlington was completed in 1993, providing an excellent environmentally-friendly access route into Alewife from communities such as Bedford, Lexington, Winchester, Medford and Arlington. More people discovered ways to peacefully enjoy the area and help keep it clear of trash.

A current issue of concern is whether it is wise for the MDC to sell to Arthur D. Little Co. the parking lot which the latter is leasing from the state. A.D.L. has hosted several meetings encouraging neighbors to consider the issues and make known their values regarding the sale. The North Cambridge Stabilization Committee has met on this issue as well as Coalition for Alewife, which has found an able spokesman in Dan Geer. The transaction must have the approval of the legislature. Some common ground is as follows: 1) desire to support management of the Alewife open space; 2) seeking a different "footprint" for the company's arrangement of buildings that will be harmonious with the river's edge; and 3) broadening the green border between Little River and the parking lot.

One hundred years after the filling of the Pine Swamp, east of the Blair Pond area off Concord Avenue, which ushered in a century of development in Fresh Pond-Alewife, the MBTA's Red Line Extension came to Alewife in 1984. There are concerns about a new era of development at Alewife, one of Cambridge's few remaining open spaces. Natural historian William Brewster's description of that earlier period is instructive for us today:

Up until 1875, or a little later, it (i.e. Pine Swamp) remained an essentially primitive and strikingly beautiful bit of wilderness. Nearly half the swamp was shaded by enormous white pines ...

There were also a number of fine old oaks, beeches and yellow birches, growing along the lower slopes of the neighboring ridge. Pouf Pond, then filled with sweet if somewhat muddy water, lay hidden in the innermost recesses of the swamp... the Pine Swamp continued to afford a congenial and reasonably secure retreat for most of the larger species of birds--as well as very many of the smaller ones ... It was frequented in autumn and winter by Hawks and Owls, in spring and summer by Night Herons and Green Herons ... Its secluded little pond was often visited by Black Ducks and Blue-winged Teal.

Table 7-1
Alewife Fish, Birds and Wildlife Mid-1800's to 1993

SPECIES, TYPE	BEFORE 1876-1884	1884 TO 1906	1972 TO 1984	AFTER 1984
alewife/ herring	plentiful	plentiful	many, #1	a few, #1
bittern, American	probably several	summer residents	one, #2	probably none
bittern, least	present	increase	none observed	none
bass, large mouth			fairly common	some/Little Pond
blackbird, red-winged	common	common	small nesting colony	small nesting colony
carp	none	none	6-8" orange present, #3	many, large present
cormorant, double-crested				
coot, American	present	present	occasional	none observed
duck, black	common	summer resident	a few, #4	seldom, one or two
duck, wood	common, often nests	less common	#5 occasionally	occasionally
flycatcher, willow			nested, #6	present
gallinule, common	present	increase	none observed	none
goose, Canada	present	present	present	four families, #7
grebe, pied-billed		migrant & summer	occasionally one	possibly none
grouse, ruffed	year-round	none	none observed	none
goldfinch, American			present year round	present year round
hawk, red-tailed	present	not nesting	one visits frequently	visits, #8

Notes to Table 7-1

- #1: Alewives continue to arrive at the dam at Mystic lakes; herring gather at Winn Brook outlet culvert on Little Pond and along the shore of the pond during the spring run. (See Map 3)
- #2: The American bittern is blue-listed, warning of its rare and declining state. Dickinson Henry and Stew Sanders approached A.D. Little Co. from Perch Pond by canoe when one surprised them and flew from the tall grass at the edge of the river about 20 yards away. The next week's Cambridge newspaper showed a picture of a bittern outside a store on Massachusetts Avenue.
- #3: Cormorants have increased in population through much of their range.
- #4: Throughout its range, the black duck is declining from cross-breeding with mallards.
- #5: The wood duck, almost extinct in the early 1900's, is conservationists' early success story. A nest box should be tried in Alewife. In spring migration they appear and nest in Concord.
- #6: Nest was discovered near buildings toward Route 2.
- #7: Canada geese are becoming numerous in the area, attracted to winter feeding and mowed grass next to water.
- #8: A red-tailed hawk nested in the 1980's about two miles west of Alewife. This would be within that nesting bird's home range. The hawk feeds on cottontails and voles which are numerous on both MDC and ADL lands.

Table 7-1(cont'd)
Alewife Fish, Birds and Wildlife

SPECIES, TYPE	BEFORE 1876-1884	1884 TO 1906	1972 TO 1984	AFTER 1984
heron, black-crowned night	nested, #9	fewer	several, not nested #9	5-10, no nests
heron, great blue	probably present	probably present	occasional, #10	2-4 in fall
heron, green-backed	nested	present	occasional visit	spring migration
herring, blueback			many spawned & young	some spawning, #1
kestrel, American	hawks were present	no nests noted	probably nested	visit, #11
kingfisher, belted			nest disturbed, #12	present
mallards			nesting & winter flock	nest & winter
osprey	common, fished		regular, fall #13	fall, flies over
owl, great horned	present, one breeding	not observed	probably visited	winter, #14
pheasant, ring-necked	none	probably none	common & nested	nest, #15
pickereel	present in Fresh Pond	possibly in marshes	none	none, #16
rail, sora	present	increase	none	none
rail, Virginia	present	increase	none	none
robin, American			common, some winter	common, some winter, #17
snake, garter		#18	observed two places	one sighting

Notes to Table 7-1

- #9: In the evening, black-crowned night herons still fly across Belmont toward the Watertown Dam on the Charles River just as Brewster described in his work. When people approach the roosting trees along Little River, the birds take off, usually circling and finding another spot in the Alewife area. (See Map 1)
- #10: Great blues along Little River and Little Pond tolerate people to about 100 yards before changing to an alert behavior; at about 80 yards they fly. Two or more flushes result in their leaving the area for Fresh or Spy Pond, possibly to return the next day.
- #11: Employees of W.R. Grace reported a pair of American kestrel nesting in an opening in the wall of their building about 1970. A box was erected about 1980 between the access road and Route 2. Sometimes a wintering female is observed and on one occasion was seen feeding on small mice. Fewer are seen in Eastern U.S., possibly due to fewer available nesting cavities in dead trees. From 1985-1993 they were seldom seen in Alewife.
- #12: When the State bought a parcel next to Wellington Brook, the seller removed a pile of topsoil in which a kingfisher had dug a nest hole. It dug another, but that pile also was trucked away. Landscapers should consider constructing a similar feature.
- #13: Osprey declined in the 1950's due to DDT but recovered in the 1970's and 1980's. They had an easy target in the smaller red carp and seldom made a dive without coming up with a fish.
- #14: For three years in the 1980's, great horned owls nested about 2 miles west of Alewife. They hunted the woods on the top of Belmont hill and Alewife. One roosted each day for several weeks in a tree near Little Pond.
- #15: Ring-necked pheasants were introduced into the U.S. Stew Sanders released his captive pheasants in Wellesley about 1960.
- #16: In the 1980's Urban Runoff Survey of the Upper Mystic Lake, pickereel comprised 2.5% of Lake fish.
- #17: In a suburb development, robins' eggs and young suffer significant losses from predation, especially by crows.
- #18: People killed all snakes that they found

Table 7-1(cont'd)
Alewife Fish, Birds and Wildlife

SPECIES, TYPE	BEFORE 1876-1884	1884 TO 1906	1972 TO 1984	AFTER 1984
snipe, common	probably present	perhaps nested		
sparrow, Lincoln's	present	present		observed in fall
sparrow, song			present year-round	some year-round
swans, mute	probably common	nested		two in 1988
teal, blue-winged				
vireo, warbling	probably common	probably common	probably nests	probably nests
warbler, yellow	common	less common	common, nesting	some nesting
woodcock, American	present	increased	several in spring #19	one or two
wren, long-billed	common	less common	none	none
wren, short-billed	common	common	none	none
yellow-throat common			present, probably nests	present, probably nests

Notes to Table 7-1

#19: An American woodcock nest was discovered near Earhart Dam

Epilogue

The clouds are glowing red now as the sun sets at the close of Memorial Day, 1994. Over the hill in Belmont where water is retained and gives pressure for Cambridge's water supply, a flock of about eight black-crowned night herons--that may have fed on a few alewives at Little Pond or Little River--passes silently in flight to the south-southwest.

At the beginning of this century, Brewster wrote of Belmont people sitting on their porches, relaxing and watching the flight of the herons from Alewife Brook's resting area to find the plentiful night fishing at Watertown Dam (and few if any noticed their early morning return). Today, near the close of this century, the same flight is repeated but possibly nobody noticed them or realized that they were herons and not gulls.

You, our reader, are now aware of them and you understand that they use the trees along Little River to rest; you know how to enjoy without disturbing them. I urge you with all the power to persuade that these printed words hold: respect their place, take time to notice the flowers, and cherish your wonderful role as a steward of this land called Alewife.

Stew Sanders
Belmont, Mass.
May 1994

Appendix F

Fish in the City: Challenges Facing the Mystic River Herring Run

Introduction

The Upper and Lower Mystic Lakes in Arlington/Medford form the headwaters to the Mystic River, which flows through Arlington, Somerville, Everett and Chelsea before emptying into Boston Inner Harbor. The Mystic provides seasonal habitat for spawning river herring, the health and future of which are the subject of this report. The Mystic River herring¹ run is largely healthy, according to local and state officials (Chase/Reback). However, stresses on the population, including direct physical barriers to migration, reductions in spawning habitat, and excessive pollution spell an uncertain fate for the future of the Mystic River herring.

This report has been prepared for the Alewife Mystic River Advocates (AMRA), a multi-community advocacy group working to promote public awareness of the Mystic River basin. The goals of the AMRA are to restore ecological integrity and vitality to the Mystic River Basin and to enhance recreational opportunities through watershed-based management. AMRA is currently undertaking several activities to promote awareness and stewardship of the Mystic River watershed and has identified the herring run as a focal point of their efforts. This report, intended to support AMRA's work, synthesizes the empirical and anecdotal information that is available on the Mystic River and the herring run in order to begin the process of understanding the existing pressures on the fish and how they can be mitigated. AMRA will be able to use this report as a foundation for their advocacy efforts.

The primary areas of study for this report are the Upper and Lower Mystic Lakes in Arlington/Medford and the Mystic River. The Aberjona River, Horn Pond Brook, Mill Brook, Alewife Brook, and the Malden River all feed into the Mystic River. At the Mystic's confluence with the Chelsea and Charles rivers, just downstream of the Tobin Bridge, the river enters Boston Inner Harbor. Although this report does not examine these tributaries in detail,

¹ The Alewife and the Blueback Herring are collectively referred to as "herring" for the purposes of this report, except in instances where different conditions for each species are specifically discussed.

it is important to note that their quality directly impacts the water quality and potential spawning habitat of the Mystic River. (See *Figure 1 - map*)

The Mystic River herring run is composed of two closely-related species, the alewife and the blueback herring. For simplicity's sake, we refer to both species as "river herring," unless specific delineation is necessary. River herring are anadromous fish, meaning adults spend the majority of their life in a saltwater environment and return to freshwater streams and lakes to spawn in the spring. Herring born in the Mystic River will migrate to the Atlantic Ocean and then return to the Mystic after three or four years, when they are ready to spawn.

Herring provide many benefits to the Mystic River ecosystem, regional fisheries, and the surrounding communities. The herring provide a food source for such game fish species as freshwater bass, pickerel, and perch, as well as several species of birds, thus enhancing the food web. The presence of herring in the lakes can help improve water quality and reduce sedimentation. Community-based efforts to restore the herring run can also serve as a catalyst for widespread watershed stewardship.

This report is divided into five major sections. Section I begins by providing some of the known history of the herring run and the Mystic River watershed, as well as the Mystic herring's relationship to regional fisheries. Section II describes the specific needs of the herring, including spawning and habitat requirements. Water quality, nutrient loading, eutrophication and anoxic conditions in the Upper and Lower Mystic Lakes are also detailed. Section III provides a description of the physical and biological barriers to migration and spawning viability, including the Upper Mystic Lake and Amelia Earhart Dams, sedimentation and pollution, and an analysis of the potential benefits that might be achieved through the construction of a fish ladder at the upper dam. Section IV outlines the reasons for reintroducing herring to the Upper Mystic Lake, and Section V concludes with recommendations for further study and actions that AMRA volunteers may want to undertake to improve the Mystic River herring run.

**Figure 1
Mystic River**



I. History of the Mystic River Herring Run River Herring Species

Alewife (*Alosa pseudoharengus*) and blueback herring (*Alosa aestivalis*) are anadromous fish which are found on the east coast of North America up to 130 km out to sea. Alewife are believed to be predominant in the Mystic River and the Mystic Lakes, because the lower Mystic Lake provides preferential spawning habitat for alewife (Peltó, telephone comm., 2/6/97). Alewife have also been observed in Alewife Brook and Mill Brook. Optimal spawning conditions for both species will be discussed in Section II.

Alewife and blueback are both migratory species and are widely distributed along the North American Atlantic coast. Spawning habitat for alewives extends as far south as North Carolina and as far north as the Gulf of St. Lawrence in Canada. Blueback herring are known to spawn as far south as Florida and as far north as Nova Scotia. Each species also spawns at different times. Alewife begin to spawn in Massachusetts rivers in early to mid-April. The onset of blueback spawning activity in New England generally begins in mid-May and lasts into June. (Loesch 1987)

Importance of Regional Herring Fisheries

Long before European settlement native americans in eastern New England relied on the annual herring run for sustenance. Early colonial records indicate that herring was also a key food source for early European inhabitants of New England (Belding 1920). In 1920, with the decline of shad fisheries, herring were seen as the most "commercially valuable anadromous fish in Massachusetts," used as a source of food for humans and as bait for commercially important fisheries (Belding 1920). Currently, herring are critical to the commercial fisheries and the marine ecosystem as a food source for freshwater bass, perch, and bluefish.

Overfishing and reduced spawning habitat have contributed to the overall decline of the Massachusetts herring fishery since colonial development. In fact, the first herring fishing

regulation was enacted in 1730, when Plymouth residents were ordered not to take more than "four [50 gallon] barrels" of herring each. By 1815, it was difficult for households to obtain 200 alewife each. Early accounts include the Mystic River among productive herring spawning rivers and streams in Massachusetts. At one point, the Mystic served as an active fishery. In 1844, for instance, there was a single catch of 50,000 herring. However, by 1920, the Mystic was identified among streams, including the Merrimack, Charles, Neponset, and Connecticut, that had shown the greatest decline in herring stocks. (Belding 1920)

Between 1933 and 1943, Massachusetts' commercial herring fisheries produced an average catch of one million pounds each year. By 1970, however, only five Massachusetts streams were commercially fished for herring and produced a catch of only 44, 319 pounds, indicating a serious decline in the herring population. (Reback and DiCarlo 1970)

Decline of Herring Fisheries

Throughout the Commonwealth, four main reasons for the decline of herring fisheries were identified more than seventy-five years ago: (1) destruction of spawning grounds, (2) obstruction of migratory pathways, (3) river pollution, and (4) overfishing. Obstruction and pollution were, and still may be, particular problems for the Mystic River. (Belding 1920)

Since the Mystic River watershed was first settled, several changes have led to negative impacts on the Mystic herring run. At one point, there were locks in West Medford, at the Craddock Dam, that made it "almost impossible for alewives (and blueback herring) to pass even at high tide, so that few fish reach[ed] the Mystic Lakes for spawning." (Belding 1920, p. 82) The Craddock locks are no longer in place. However, the Amelia Earhart Dam, which was constructed in 1966, partially impedes the herring run since no formal provisions have been made to allow the fish to pass through the locks. A complete discussion of the existing barriers to migration appears in Section III.

There is also a dam between Upper Mystic Lake and Lower Mystic Lake. At one time there was a fish ladder in place, although it was essentially inoperable. The Belding report

states, "between the Mystic Lakes is a dam equipped with a wooden Brackett fishway of little use, since the water level is not sufficiently high to afford flowage." (Belding 1920, p. 82) This fish ladder no longer exists and the herring run is still clearly impeded by the Upper Mystic Lake dam.

Even if the Mystic had remained clear of physical obstructions, pollution increased with settlement and industrialization along the river, posing a threat to the viability of a healthy herring run. Earlier this century, sewage was a significant problem for the Mystic herring run. Although direct sewage discharges no longer occur, combined sewer outfalls on Alewife Brook and the Lower Mystic River send a mix of stormwater and raw sewage to the river during heavy rains. Currently the Massachusetts Water Resource Authority (MWRA) is working with local communities to reduce combined sewer overflows (CSOs), but these efforts are not likely to completely eliminate CSOs to the Mystic River and its tributaries. (MWRA 1994)

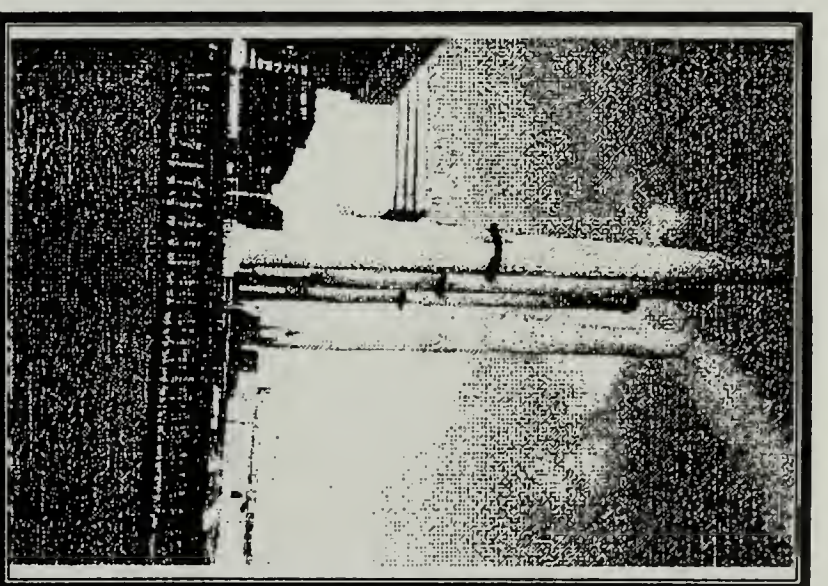
Industrial wastes were also an historic problem for the Mystic River. The Belding report identifies problems with chemicals coming from nail and iron works, rubber factories, wool scouring operations, bleacheries, laundries, dye works, and leather factories (Belding, 1920) The historic industries that contributed to the pollution load of the Mystic are no longer in operation, and existing industries are required to be in compliance with current water pollution control regulations. However, toxins still present in the river system from historic industries may pose a problem.

Current Land Use and Development

Although point source pollution from industries in the watershed has decreased, non-point source pollution from stormwater runoff has increased with expanded residential and commercial development. More road area and buildings also increase the impervious surface area in the Mystic watershed. Consequently, less stormwater can infiltrate to the ground and be naturally filtered. When it rains, stormwater runoff flows through sewers and carries pollutants from streets, yards, parks, parking lots, and industrial operations directly to the Mystic River.

Current land use along the Mystic River and in the watershed is varied. Residential development predominates the upper reaches of the river, where the banks are mostly park space. Although the buffers between the river and development are not of an ideal width, the banks do have some protective vegetation.

Closer to the Amelia Earhart Dam, more business parks and large parking lots dot the landscape. Interstate 93 travels right along the edge of the Mystic on the west side. The east side of the river is home to the Mystic River Reservation, which has a park-like setting with natural vegetation along the river bank.



Boston Edison

dominant land use along the Mystic River and Boston Inner Harbor. Boston Edison, DistriGas, an Atlantic Fuels oil terminal, a Polarized scrap metal yard, and a Big Dig staging area are all located in this area. In addition, road salt is stored on piers directly above the river and harbor waters.

The Mystic River and Mystic Lakes are an important source of recreation space for the surrounding community. There is an MDC boat house on the west bank of the lower river and a small marina near the interchange of I-93 and Route 16. The Tufts Sailing Club uses the Upper Mystic Lake and the Lower Mystic Lake is home to the Medford Boat Club. MDC owns and operates a beach on the northern end of the Upper Mystic Lake. In addition to the more formal recreation opportunities, the river and lakes provide a chance for the surrounding community to enjoy the serenity of the outdoors through canoeing, birdwatching or simply strolling along the riverbanks.

The literature reviewed for this report provides a comprehensive glimpse of what the health of the Mystic herring run used to look like. However, information on the current status of the herring run is lacking, and it is therefore difficult to gain a solid understanding of the effects that the stresses described above have on the herring population. In order for AMRA to determine the potential for improving the herring run, we must first review the basic needs for spawning herring.

II. Spawning Requirements for River Herring

General Migratory Patterns

Distinguishing between alewife and blueback herring by their external features is extremely difficult. Alewives are generally longer than bluebacks of the same age and there are slight differences in their scale patterns. The most reliable discerning feature is the tissue lining of the body cavity. In a blueback this tissue, the peritoneum, is dark brown to black. In the alewife, the tissue is gray to silvery and has small dark spots. (Ross and Biagi n.d.) (See Figure 2)

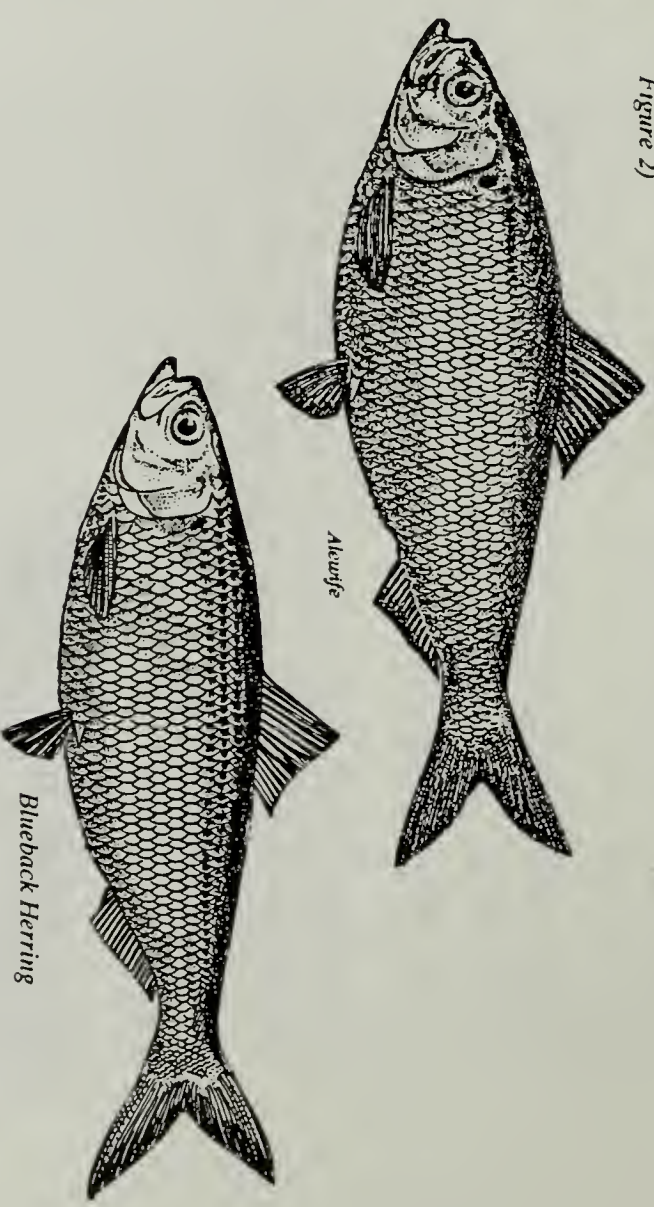


figure 2

As with all anadromous fish, adult herring spend the majority of their lives in a salt-water environment and return to freshwater streams and lakes to spawn. This seasonal breeding migration typically begins in early spring and is directly related to water temperature

(Loesch 1977 and Klauda *et al* 1994) Alewife and blueback herring return to the same streams they inhabited as juveniles in order to spawn. The herring find their way back to their natal streams using olfactory cues, or smell, as a guide. (Thunberg 1971 and Klauda *et al* 1994) This smell of their freshwater natal stream is imprinted on the fish during larval and juvenile development. As the returning fish head inland, they are able to distinguish the smell of their streams from others, and follow its increasing concentration until they reach their stream. In a sense, they are sniffing their way back home.

During each migration a certain number of fish do not return to the specific stream they inhabited as juveniles (Loesch 1977 and Klauda *et al* 1994) Rather, they migrate up adjacent or neighboring streams. One such example is when river herring that inhabited the Charles River as juveniles migrate up the Mystic River instead. By exchanging individuals between breeding populations, a sufficient amount of genetic interchange occurs to ensure that populations remain genetically robust. This process also acts as a mechanism for the colonization of new streams and lakes where herring populations have either never existed or have been decimated by pressures such as overfishing (Loesch 1987 and Klauda *et al* 1994)

The Mystic River herring begin their migration from coastal waters, moving into Massachusetts Bay, and further into Boston Harbor. From Boston Harbor they enter the mouth of the Mystic River and encounter the Amelia Earhart Dam. The herring that make it through the locks proceed up the river to Lower Mystic Lake, where most spawning occurs. Some spawning also occurs in Alewife Brook and Mill Brook. Some herring attempt to move into the Upper Mystic Lake, but passage is blocked by the Upper Mystic Lake Dam, which effectively terminates the migration.

Once migrating river herring reach suitable habitat, spawning occurs. During spawning, several similarities exist between species. Both species tend to spawn in shallow water where a single female will be pursued by several males in an attempt to fertilize the female's eggs (Loesch 1977, Loesch 1987 and Klauda *et al* 1994) Both species are dimersal broadcast spawners, meaning both eggs and sperm are released into the water and adhere to

the bottom. Blueback herring tend to prefer spawning closer to the bottom where their eggs have a greater tendency to adhere until they harden, at which point they become free floating (Klauda *et al* 1994) During spawning, females of both species release an estimated 50,000 to 400,000 eggs per individual, with an average of approximately 150,000 to 175,000 eggs. (Loesch 1977, Pardue 1983 and Klauda *et al* 1994)

After spending several days spawning, individuals begin their downstream migration to the sea. During the spawning process, mortality of the breeding adults is known to occur, but does not reach the high percentages experienced by other anadromous species such as salmon. Most adult herring do survive to return to the sea for another year and may return to spawn for as many as four consecutive years (Funderburk *et al*, 1991)

Specific Spawning Characteristics

Alewife Spawning Activity

Alewife migration begins when water temperature is between 10 to 18° C. (50 to 64.4°F)(Loesch 1977, Pardue 1983 and Klauda *et al* 1994) Migration into spawning areas is guided by light intensity, water flow, temperature, and olfactory cues. (Klauda *et al* 1994) Alewife prefer slow moving water bodies, such as ponds and slow moving streams, as spawning sites. Preferred spawning substrate ranges from gravel, sand, detritus and vegetated areas were water flow is "sluggish" in depths from 0.2 to 3 m (.7 to 6.3 ft). (Pardue 1983 and Klauda *et al* 1994) In areas where blueback herring don't create competition, alewife will use a greater variety of spawning sites. Optimal areas for spawning alewife, eggs and larvae are substrates covered with 75% silt, detritus or other soft materials. (Pardue 1983 and Klauda *et al* 1994) Eggs are semi-dimersal to pelagic, and slightly adhesive until water-hardened. Incubation of eggs ranges from approximately 2.1 to 6 days depending on water temperature with a maximum of 15 days at 7°C (44.2°F). (Klauda *et al* 1994)

Blueback Spawning Activity

Blueback spawning migration begins when water temperature is between 14 and 25°C (57.2 and 77°F). (Loesch 1977, Pardue 1983 and Klauda *et al* 1994) Where blueback herring are sympatric (same time, same place) with alewife, blueback herring reduce competition by spawning in swift moving water where the substrate consists of clean gravel or sand. (Pardue 1983 and Klauda *et al* 1994) In areas where competition for spawning sites does not exist, blueback herring will also use areas of slower moving water. However, bluebacks do not display the degree of adaptability of the alewife. (Klauda *et al* 1994) After spawning, eggs are adhesive until water-hardened, after which they become pelagic in moving water and slightly dimersal in still water. Incubation times vary between 2.2 to 3.9 days depending on temperature. Seaward migration for juvenile bluebacks begins when water temperature is approximately 21° C (69.8°F), although photoperiod, precipitation and water movement cues

may also be involved in the initiation of migration. (Klauda *et al* 1994)

Herring Feeding Activity

Larval alewife and blueback herring tend to be planktivorous, or plankton eaters, seeking larger prey as they mature. (Klauda *et al* 1994) As the herring increase in size, they feed primarily on larger zooplankton such as midges. As larvae of both species grow and mature, they appear to develop different feeding strategies, possibly to avoid competition for food. The alewife larvae become more target specific, often searching for benthic (bottom-dwelling) prey while blueback herring remain predominantly filter feeders, exploiting prey within the water column. (Loesch 1977 and Klauda *et al* 1994)

Water Quality Criteria for Habitat and Spawning

Different criteria may be used in determining the water quality standards which are related to successful breeding of river herring or other fish species. At the federal level, the Environmental Protection Agency (EPA) provides water quality guidelines for the State. The State follows these guidelines in setting the actual criteria used.

The Mystic River and the majority of rivers in Massachusetts have a state designated goal of Class B, meaning they must meet Class B water quality standards for "habitat for fish and primary and secondary contact recreation" (fishable and swimmable). In Massachusetts, these criteria are determined by the Division of Water Pollution Control under the Executive Office of Environmental Affairs (EOEA). These criteria are listed in the Code of Massachusetts Regulations 314 CMR 4.00, and are further refined in "Guidelines for Use Support Determination, Inland Waters."² The criteria are not specific to river herring, but are generic criteria for all Class B water-bodies. Table 1 summarizes the criteria applicable to the Mystic River and all Massachusetts rivers with a Class B goal.

²See Commonwealth of Massachusetts, *Summary of Water Quality, 1994*, Massachusetts Department of Environmental Protection, Division of Water Pollution Control.

Table 1: Massachusetts Surface Water Quality Standards for Class B Waters
Designated as Habitat for Fish and Primary and Secondary Contact Recreation.

DO	Temp	pH	TSS	Chlorine (TRC)
5.0 mg/l	83° F max (28.3° C)	6.5-8.3	25 mg/l	0.02 mg/l
Turbidity	Color	Oil & Grease	Taste & Odor	
Δ 5% NTU (<50 NTU) Δ 10 % (>50 NTU)	50 C.U. max	None Detectable	None Objectionable	
Parameter	Average	Maximum		
Whole Effluent Toxicity	0.05 T.U.	0.1 T.U.		
Fecal Coliform Bacteria	200 org./100ml	ngt. 10% samples 400 org./100ml		
Ammonia	@pH <7.5 1.5 mg/l	@pH >7.5 0.5mg/l		

* TSS: Total Suspended Solids, NTU: Turbidity Units, CU: Color Units, TU: Toxicity Units.

Solids:

Free from floating, suspended and settleable solids in concentrations and combinations that would impair any use assigned to this Class.

Color and Turbidity:

Free from color and turbidity in concentrations or combinations that are aesthetically objectionable, or would impair any use of this assigned Class.

Oil and Grease:

Free from oil, grease and petrochemicals that produce a viewable film on the surface of the water, impart an oily taste to the water or an oily or other undesirable taste to the edible portions of aquatic life.

Taste and Odor:

None in such concentrations or combinations that are aesthetically objectionable, that would impair any use assigned to this Class, or that would cause tainting or undesirable flavors in the edible portions of aquatic life.

A comprehensive list of habitat requirements specific to alewife and blueback herring are described in *Habitat Requirements for Chesapeake Bay Living Resources (Klauda, et al)*. Not only does this describe the habitat requirements specific to spawning river herring, it addresses the requirements of the fish at various life stages, including egg, larvae, juvenile and adult. These requirements are detailed in Table 2, below. A comparison of the requirements show that, generally, water bodies that meet or exceed Class B water quality standards will provide adequate habitat for alewife and blueback herring.

Table 2.

Habitat Requirements for Alewife and Blueback Herring for Various Life Stages*			
DO	Temp. (°C)	pH	TSS
AW ¹ >5.0 (E,L) >3.6 (J,A)	11-28 (E), 8-31 (L) 10-28 (J)	5.0-8.5 (E) 5.5-8.5 (L)	< 1000 (E)
BH ¹ >5.0 (E,L) >3.6 (J)	14-26 (E), 14-28 (L) 10-30 (J)	5.7-8.5 (E) 6.2-8.5 (L)	< 1000 (E) < 500 (L)

* Egg (E), larvae (L), juvenile (J) and Adult (A)

¹ AW: Alewife, BH: Blueback Herring

Water Quality in Upper Mystic Lake

Due to historic water quality problems, the focus on water quality studies in the Mystic River Basin has centered on the Lower Mystic Lake, the Mystic River, Alewife Brook

and the Aberjona River, a tributary to the Upper Mystic Lake. However, the Upper Mystic Lake has not received the same level of attention and documentation of its water quality.

Because of this lack of comprehensive water quality data, conclusions as to the suitability of the Upper Mystic Lake for river herring spawning habitat are tenuous. However, the limited data available (O'Shea 1989, Chesebrough and Screpetis 1975, MDC 1982 and Chase 1996) do not exclude the Upper Mystic Lake as suitable spawning habitat. This gap in available information illustrates the need for a comprehensive water monitoring program to document water quality and spawning habitat suitability.

One of the greatest threats to river herring and other fish in urbanized waterways is low dissolved oxygen. (Klauda *et al* 1994) As plants and other organic material settle and collect on the lake bottom, microbial decomposition of this material occurs. This decomposition uses oxygen which is dissolved in the water and creates what is known as biological oxygen demand, or BOD. The greater the amount of decomposing material, the greater the BOD, and less dissolved oxygen remains available for other organisms, such as herring. Historic water quality data shows this to be a problem in the Upper Mystic Lake.

In temperate deep water lakes, such as the Upper Mystic Lake, seasonal stratification of the water column occurs during summer months when warm surface waters no longer mix with colder bottom waters along a boundary known as a thermocline. Because the majority of bacterial decomposition occurs in the bottom layer, this lower layer of water becomes oxygen poor, or anoxic. These anoxic conditions can cause fish kills.

Historic stratification in the Lower Mystic Lake due to the intrusion of salt water was another cause of low DO in bottom water. However, this problem was mitigated in 1994 with the Lower Mystic Lake Salt Water Removal Project. (DiPietro, 1994) Water quality reports show no evidence of salt water intrusion in Upper Mystic Lake (*Mystic River Watershed Water Quality Survey for 1981, 1982*).

Seasonal stratification occurs in both the Upper and Lower Mystic Lakes. Since most of the lakeshore is residential, nutrients in the form of nitrogen and phosphorous from point and non-point sources may be responsible for the degree of anoxia experienced in the lakes. Overuse of fertilizers causes elevated nutrient inputs, which increases primary production, or

plant growth. The more plant growth, the more organic material is available for decomposition, the greater the BOD, and the greater the level of anoxia. By limiting the nutrient inputs to the lakes, the level of plant growth and ultimately the degree of anoxia are reduced, leaving more oxygen for other aquatic species.

III. Physical and Biological Barriers to Spawning

"The old laws regarding dams were well adapted for the protection of the fishery, the decline of which was not due to a lack of good laws, but rather to the non-enforcement of existing legislation. The only remedy for an obstructing dam is the installation of a passable fishway, with which every dam upon alewife streams, unless opened regularly during the spring, should be equipped." (Belding, p. 49-50)

Background

Official recognition that dams and other barriers were causing declines in the numbers of river herring and other anadromous fish in Massachusetts dates back to the early 18th century, when the colonial government first passed laws barring the construction of such dams to protect those populations. (Belding, p. 35) Legislative efforts to assist the herring continued into the mid-19th century, but were largely ineffective. This was recognized by the state in the early 20th century when the Belding report determined that "[t]he first step in the development of a fishery is the removal of all obstructions in order to give [the fish] free passage to the spawning grounds." (p. 48) With regards to obstructions, the "general principle that alewives should have free passage [to] spawning grounds" was cited as a "keystone of all legislation" to provide protection for the fishery. (p. 49) "In nearly all instances these laws contained specific provisions for fishways in the dams, but frequently these provisions were modified or repealed through the influence of mill owners." (Belding, p. 49) (See Figure 3 — fish ladder)

Other efforts to provide "suitable passageways for the fish" led to restocking of upstream spawning areas and several experiments in leaving dams and other obstructions (usually mills and cranberry bogs) open during the spawning season. (Belding, p. 36) Numerous incarnations of these laws were applied with varying degrees of success over the years, many of them failing for lack of enforcement. The result has been a consistent decline in herring populations due to many contributing factors, including poaching and pollution as well as the effects of dams on limiting the fish access to adequate spawning habitat. These factors continue to plague many of Massachusetts' waterways to date.

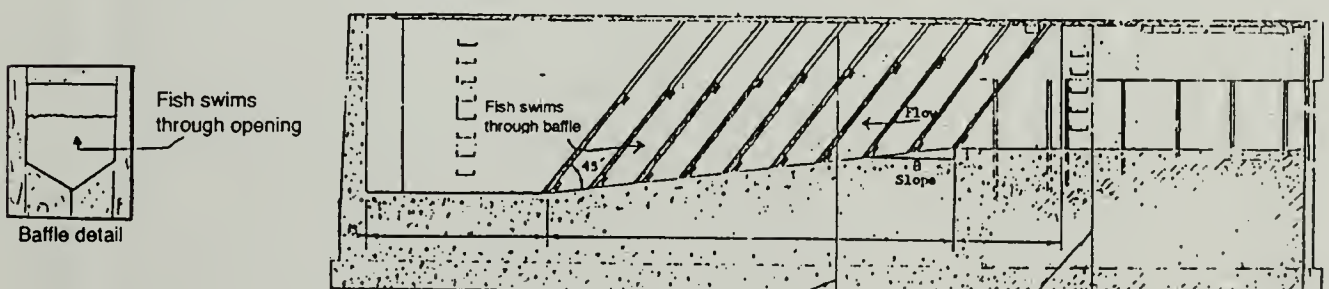
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Figure 3
Fish Ladders

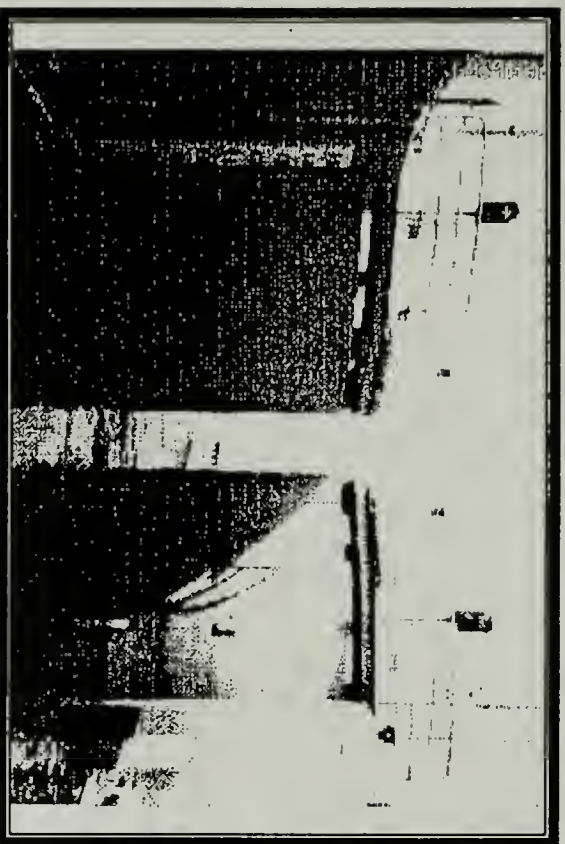
POOL-WEIR fish ladder: a series of pools with a one-foot drop in water level in between. The number and sizes of pools vary with the height of the dam.



DENIL: a long, narrow box angled to provide a one-foot rise for every ten feet. Baffles, constructed of wood or fiberglass, check the flow of water and create resting pockets. Designed primarily to pass alewives.



The situation facing the Mystic River mirrors these conditions, as will any waterway facing the level of land development, diversion and water pollution that plagues our urban areas. State officials have described the status of the Mystic River herring run as "healthy" by comparison with some other, more polluted or less passable Massachusetts streams and rivers (Chase, personal comm, Feb. 1997) However, this sentiment is without empirical basis because an actual census of the run has not been undertaken. The effects of spawning barriers are self-evident in the Mystic River, with the major impediments being the two dams: Amelia Earhart and Upper Mystic Lake. The specific effects of pollution and sedimentation on the health of the fishery are largely unknown, as no comprehensive work on the subject has been undertaken.



The Amelia Earhart Dam

The Amelia Earhart dam lies just below the confluence of the Malden and Mystic rivers in what is decidedly an industrial area. (See map, Figure 1) The dam is not a completely impassable barrier to the migration of the herring because the locks (pictured above) are opened when boats pass through. Though there is no official protocol for the locks to be

opened to aid the herring run, MDC officials at the dam stated that they do make an effort to let them pass when they are observed in large numbers beneath the dam. (J. Hurley, personal comm. April 9, 1997) However, this is a decidedly tenuous situation for the herring as they have to depend upon a passing boat or the attention and magnanimity of the lock operator to get upstream.

In addition, some of the herring are likely fooled by the flow of water from the inoperable fish ladder at the opposite end of the dam, which diverts them away from the opening locks. (B. Berman, personal comm. April 4, 1997) This ladder has been inoperable for over 20 years because it lacks a water pump. (J. Hurley, personal comm. April 9, 1997) Herring are often fooled by the tidal flow when the locks are closed and are blocked from passage, making them vulnerable to anoxia, predators and poachers.

Poaching of the herring at the dam is of some concern. Often people will wade into the river below the dam before the locks are opened (when the Herring's passage is blocked) and take a substantial amount of fish. (B. Berman, personal comm, 4/4/97) Generally, private citizens are permitted to take 10 fish if the MDC rules apply, or as much as a 5-gallon bucket-full in some areas where individual town rules apply. Presumably the MDC rules apply below the Amelia Earhart dam. However, commercial fisherman, who use the herring as bait fish, will sometimes corner the fish below the dam and take as much as 1-2,000 pounds away. (Berman) Recreational fisherman take the fish as well, but generally observe the limits imposed. The timing of the taking is of more concern than the actual number of herring caught since they are prevented from spawning. Taking the herring at the dam can have significant negative impact on the overall population.



Upper Mystic Lake Dam

The Upper Mystic Lake Dam (pictured above) lies between the Upper and Lower Mystic Lakes and represents the end of the river herring's migration on the Mystic River. (See map, Figure 1) This dam is impassable for the fish, except for the few who are the beneficiaries of the occasional well meaning citizens who toss the struggling fish over the dam into the Upper Mystic Lake. This practice has ecological benefits for the Upper Mystic Lake although it does nothing to enhance the herring run. While the fish that are rescued may survive, their offspring may never reach the sea once they are ready to make their own migration. Thus, their potential contribution to the health of the run itself, as well as any tangential benefits for other regional fisheries are lost.

The Commonwealth of Massachusetts has appropriated \$330,000 to finance a feasibility study for reconstruction of the Upper Mystic Lake dam. The new structure may include a fish ladder, which would provide the herring with access to new spawning areas in the upper lake, and perhaps in the Aberjona River. The feasibility of a fish ladder at the dam is also to be reviewed. (P. DiPietro, personal comm. 2/97) However, the money for this project is frozen in the MDC budget, meaning it cannot be used until the state DEP chooses to make

the construction of the dam a priority.

The Upper Mystic Lake itself would provide 166 additional acres of spawning habitat, but the quality of that habitat is largely unknown. The quantity and quality of spawning areas beyond the Upper Mystic Lake is not known either. Neither the timing of the new dam's construction or a definite signal as to the likelihood of inclusion of the ladder could be determined from our conversations with the MDC and DEP. This issue is revisited in our list of recommendations. The increase in spawning habitat that would result from providing the herring with a passageway to the Upper lake would likely result in a tremendous increase in the annual run. The tangential benefits that would follow this increase are detailed in Section IV.

Pollution and Sedimentation

The banks of the Mystic River directly above and below the Amelia Earhart Dam to the Inner Harbor are lined with industrial properties, including Polarized Metal's scrap metal yard, which features at least two outflow pipes that flow directly into the river. District Gas, Atlantic Fuel's oil refinery and Boston Edison also abut the river. Municipal storage areas below the Tobin bridge on the south bank feature an enormous road-salt storage area which is not tarped, presumably allowing rainwater runoff into the river. All of the properties described here are regulated and are assumed to be in compliance with state and federal laws for point-source discharges.

However, many pollutants enter the Mystic River, mostly from CSOs and unregulated non-point sources. Runoff from streets, parking lots, and sidewalks carries numerous contaminants, including hydrocarbons, fecal coliform, sediments, litter, and heavy metals such as cadmium and zinc. Runoff from lawns and gardens can pick up nutrients, such as phosphorus and nitrogen, from fertilizers. Residential areas that use pesticides for lawns and gardens can also contribute to stormwater pollution, sending persistent toxic chemicals to the Mystic. Sediments can come from a number of sources, including construction sites and other private properties with ineffective soil erosion controls.

The direct effects of pollution may contribute to the death or increased susceptibility

to disease among river herring. More indirect effects include the destruction of eggs and young, and changes in vegetation and food supply. (Belding, p.53) Though adult herring may be able to withstand higher pollution levels than their young, the presence of sewage, excess nutrients and industrial waste may make the fish unfit for consumption. The primary effect of sedimentation on the herring is that it decreases optimal spawning habitat. An additional consequence of high concentrations of suspended solids is an increase in the rate of fungal infection of herring eggs resulting in high mortality rates. A brief review of the applicable Massachusetts water quality standards reveals that addition of these pollutants to the Mystic River and other Class B water bodies must be severely limited to meet the goal of "fishable, swimmable waters."

IV. Reasons for Reintroducing River Herring into Upper Mystic Lake

In the course of our conversations with all of the state and local officials that helped us with our compilation of information for this report, we were often asked the same question. People invariably wanted to know why we are trying to enhance the river herring run, or sometimes, why we are advocating the inclusion of a fish ladder in the reconstruction of the Upper Mystic Lake Dam. Beyond the principle of "more is better," there are several important reasons for restoring the run. These reasons are listed below.

1. The organic material from decomposing fish in the upper reaches of the Mystic watershed will aid in the decomposition of benthic detrital matter, such as leaf litter, thereby reducing sedimentation and improving overall water quality.
2. River herring are planktivores, meaning they consume zooplankton and insect larvae. Reintroducing them to the upper lake will help to restore the historical food web structure within the lake.
3. River herring larvae and juveniles are preyed upon by bass, several species of perch, pickerel and pumpkinseed as well as several species of birds. Increasing the food source for these species will enhance outdoor recreational activities such as sportfishing and birdwatching.
4. Herring are a prey species for many oceanic fish species. Increasing available spawning areas for herring will effectively increase fish stocks for commercial fishing interests.
5. With the depletion of groundfish stocks, alternative species such as herring are being examined for commercial potential. Maintaining a sustainable population and maximizing spawning habitat could provide direct economic benefits.

6. Focusing on the reintroduction of herring into the Upper Mystic Lake can illustrate the complex issues surrounding watershed management and serve as a catalyst for ecological stewardship of the Mystic River Basin.
7. By involving surrounding communities such as Somerville and Medford in the efforts to restore the Herring run, advocacy groups like the AMRA can help to instill a new sense of connection and investment by these communities in the health and stability of the Mystic River Basin. This can in turn lead to a greater level of involvement and stewardship by these communities and help to instill a sense of pride in their surroundings, which will eventually lead to a cleaner and healthier watershed.

V. Recommendations

1. *Train Advocates for volunteer monitoring.* The University of Rhode Island Watershed Watch is sponsoring an interactive conference in Kingston, RI, on June 6-8. The conference is designed to inform citizens of methods to protect and enhance water quality. One session is specifically geared toward monitoring programs and training volunteers. Advocates attending this session, in turn, can train volunteers in the area to monitor water quality, habitat characterization, and poaching. Contact Carol Hildreth at 508-429-5085 for more information.
2. *Work to create an official protocol for allowing herring to pass through the locks at the Amelia Earhart Dam.* This will prevent massive fishkills from occurring when the herring get "stuck" at the dam during spring migration and are consequently poached or preyed upon. Protocols must be put in place to protect the herring. The herring represent a significant resource and should be given regular access to their spawning areas. Open the gates and let them spawn! The locks should be kept open during the migratory season. (Berman) If protocols for the way fish are dealt with are to change, herring restoration itself must be made a priority. At the Gridley locks (on the Charles river) there is a conscious effort made to let the herring through, there is no such formal policy in place at the Amelia Earhart Dam. Rather, the fate of the fish is at the whim of the lock operators, and the dam is operated primarily for flood control and marine traffic. Herring migration should have equal standing with these considerations. There is a much bigger herring run at the Gridley locks, partially for this reason.
3. *Seek funding for repair of the fish ladder at the Amelia Earhart Dam.* The fish ladder at the Amelia Earhart dam is currently inoperable. Funding should be sought to repair and maintain the ladder.

4. *Advocate for MDC prioritization of upper dam fish ladder.* The Commonwealth of Massachusetts has appropriated \$330,000 for the Metropolitan District Commission to produce an engineering feasibility study and workplan for replacing the Upper Mystic Lake Dam. (P. DePietro, personal comm. Feb. 1997) The newly constructed dam is tentatively scheduled to include a fish ladder which would allow for the passage of anadromous fish, including the Alewife and Blueback Herring, into the Upper Lake and beyond. However, the money for this project is frozen in the MDC budget until the DEP chooses to make the construction of the dam a priority. Raising the awareness of local citizens and empowering activists to pressure the state to take action may speed this process. Actions include lobbying DEP, organizing a citizen call in to local representatives, or petitioning. Local residents should contact their state representatives to make them aware of the issue.

5. *Undertake official fish count.* The Massachusetts Division of Fish and Wildlife needs to undertake an accurate herring census using automatic fish counters. This information will be especially pertinent when and if the fish ladder is constructed at the Upper Mystic Lake Dam, in order to compare the strength of the run before and after construction. Comparative fish counts will be necessary to assess the benefits of a fish ladder to the Mystic River system. It is not feasible for a valid census to be undertaken by volunteers due to the size of the river, which makes observing the fish difficult.

6. *Conduct Water quality studies.* Although the Commonwealth of Massachusetts is required by law to collect water quality data, an extensive search for the data bore limited results, which calls into question whether this information is actually being compiled. An effort should be made to develop channels of communication among the agencies MDC, DEP and DEM, and to identify areas of responsibility, so that they can fulfill this mandate.

7. *Map spawning habitat.* There is little documentation of herring spawning sites in the Mystic River Basin. Habitat characterization is a key link to understanding the strength and health of the herring run and its future. Use volunteers in the surrounding community to assess

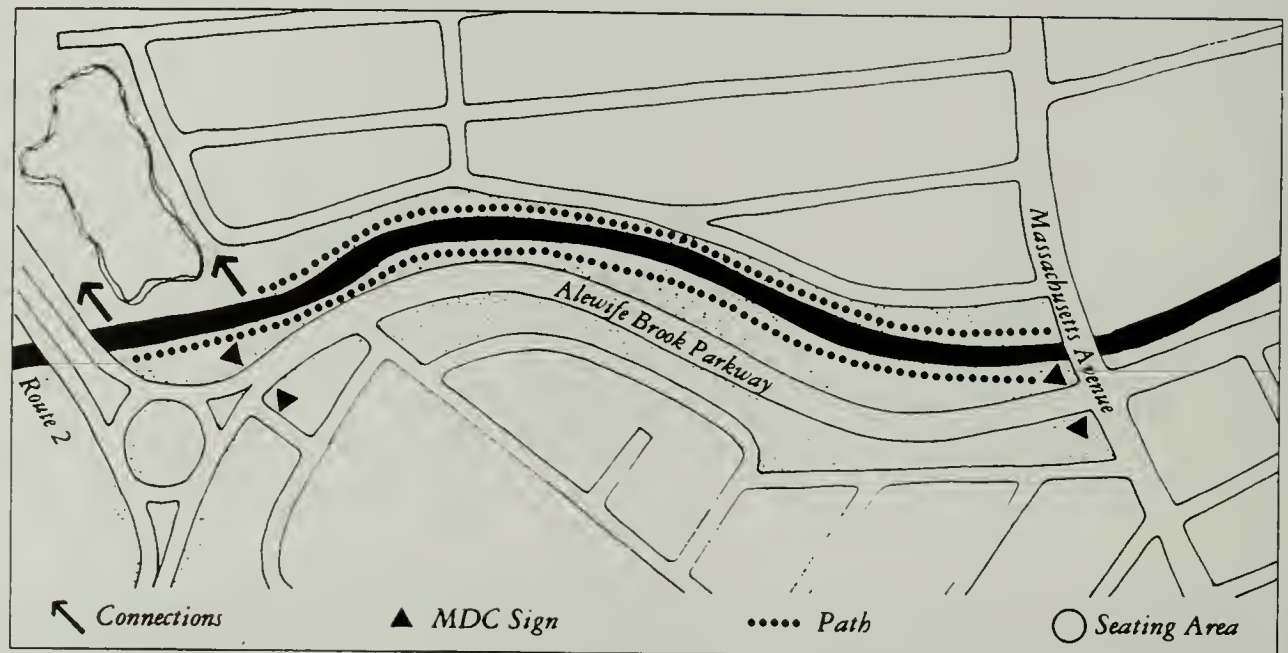
habitat suitability as well as to create a sense of stewardship for the community surrounding the Mystic River (see Volunteer Monitoring Manual).

8. *Address the poaching problem.* Public education is a good way to remedy the poaching problem. Advertise the limits that apply and where the fish can be taken. Other options for regulating the take could include stationing a steward at the dam to provide dip nets. Dip nets are the least harmful method of catching the fish, but are too expensive for many recreational fishers to buy. Another good idea is what is currently done on the Back River: people pay a "herring warden" \$5 and he nets 6 herring. Generally, any illegal activity that is witnessed by advocates should be reported to Dick Murray, with the Environmental Police (state DEP). (Berman, personal comm. 4/4/97)

Appendix G

*Metropolitan District Commission Parkway Restoration: A Master
Plan for Segments of the Alewife Brook and Mystic Valley Parkways*

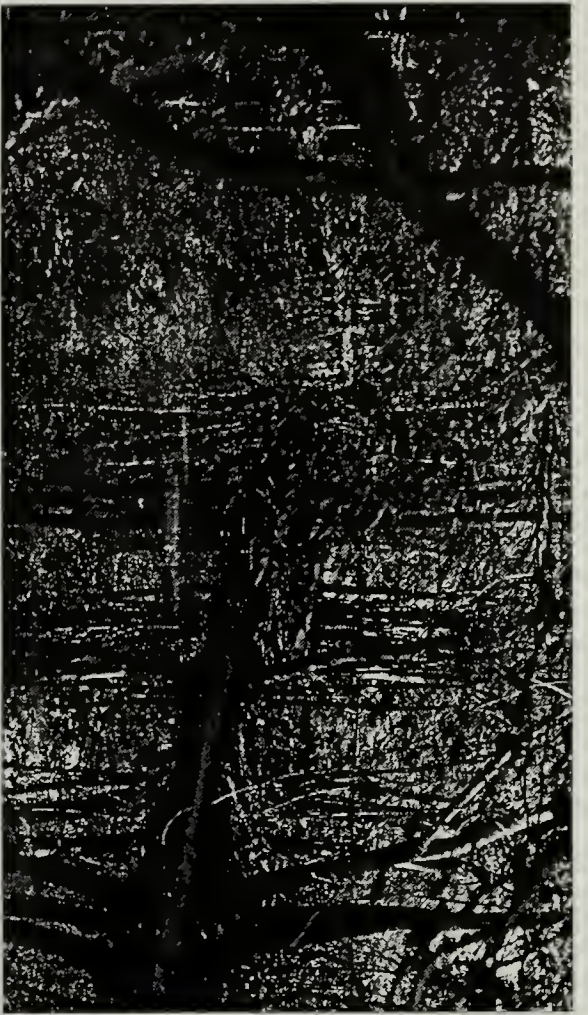
Alewife Reservation Alewife Rotary to Massachusetts Avenue



Segment Character

Segment One is bounded by the signalized rotary area at Route 2 and Massachusetts Avenue to the north. Arlington is west of the brook and Cambridge is east of the brook. The park land varies from the open meadow east of the former cattail marsh in Arlington's Thorndike Field area to the densely populated neighborhoods of East Arlington and North Cambridge. The character of the surrounding area is predominantly residential on both sides of the parkway. The W.R. Grace complex, the City of Cambridge playground, and Arlington's Bicentennial Park are the only non-residential abutters.

The Alewife Brook is contained in a concrete culvert and fenced with four-foot high chain link. Weeds and mature vegetation grow within the fence's fabric and create an unkempt appearance. Vegetation on the brook's western/Arlington side effectively screens the parkway traffic from the residential neighborhood. In this segment, there are few views to the major natural feature, the Alewife Brook, except at the Massachusetts Avenue Bridge. Occasionally homeless people live in a somewhat isolated area between the Route 2 embankment and the brook.



Alewife Brook, bordered by vegetation, chain link fence and concrete culvert

The Alewife Station and the Minuteman Bikeway are important transportation destinations immediately adjacent to the segment. Throughout the park, manholes, vents, concrete utility covers and the fenced Algonquin gas "farm" intrude upon the park character.

Short-term Improvements

1. Remove the chain link fence and vegetation on Alewife Brook's Cambridge/parkway side. Leave any mature specimen tree that is a native and appropriately placed.
2. Install new granite curbing, with a ten-inch curb reveal, along both sides of the parkway to help separate the cars from the park land users, and to identify the park land use. When installing the granite curbing along the parkway, regrade where utility manholes intrude upon the landscape.
3. Install historic 1907 street lights along the parkway edge.
4. Reinforce the parkway tree edge by replacing missing or dying shade trees along the curb, Boulevard Road, and Columbus Avenue. Recommend new species of red oaks, sycamores, or red maples that withstand urban conditions. Augment the Fall 1992 sycamore plantings in the Route 2 rotary island by planting additional sycamores and red oaks along the Route 2 entrance to the parkway.

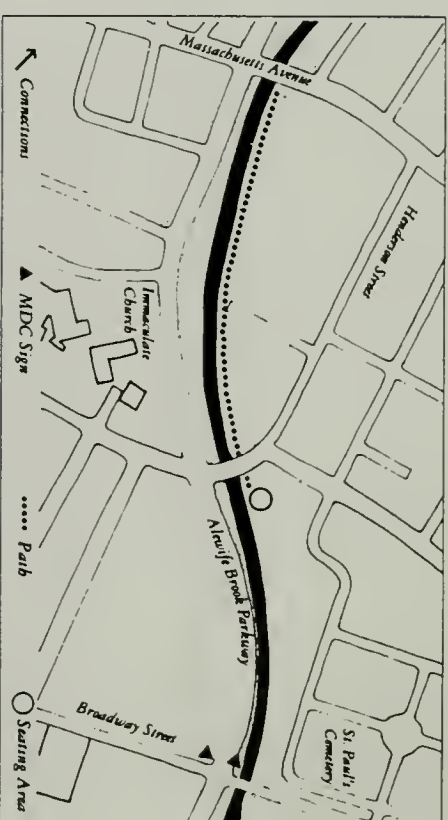
5. Install four new MDC directional signs for vehicles at the corners of Massachusetts Avenue and at north- and south-bound parkway lanes entering the Route 2 rotary. These signs would direct the users to the Alewife T Station and Minuteman Bikeway.
6. Install a "Shurcliff" metal gate at the end of Lafayette Street and at the beginning of the existing dirt road to keep cars out of the neighborhood and this natural area. Install lighting at the proposed new bridge to increase safety at night. Lights should be focused on path away from neighboring houses.
7. Maintain Segment One park land, and include proper tree care, such as pruning and aeration, and fertilizing care of mature and new trees; lawn management; regular trash removal; and regular cleaning of multi-purpose path.

Long-term Recommendations

1. Install a multi-purpose path for pedestrians, cyclists, and in-line skaters on the brook's parkway side.
 - a. Construct a wooden bridge across Alewife Brook to connect this path to the nearby Minuteman Bikeway.
 - b. Screen the neighborhood from the multi-purpose path with a planting of evergreen trees.
 - c. Formalize the dirt path, perhaps with a stone dust base, on Alewife Brook's Arlington side. (This woodland path would allow pedestrians to explore the existing meadow area which abuts the cattail marsh which was acquired by the MDC in 1993.)
 - d. Two locations are proposed for linking the MDC's multi-purpose path with the existing Minuteman Bikeway. One is on the former railroad spur, the northern boundary to the MDC cattail marsh, and another location is along the bottom of the Route 2 embankment, the southern edge of the cattail marsh (which at this point is actually phragmites). The railroad spur location is desirable because of its direct link to the Minuteman. The embankment path will need careful detailing in a sensitive wetlands area. The MDC, working with the Town of Arlington, can most successfully resolve this aspect of the plan.
2. Consider improvements to the Cambridge-maintained playground which is located on MDC park land adjacent to Shea Road in North Cambridge.

St. Paul's Catholic Cemetery Massachusetts Avenue to Broadway

3. In consultation with traffic engineers, install a signalized pedestrian crosswalk near W.R. Grace to allow people safer access to the T Station by way of the new multi-purpose path.
4. After completion of necessary sediment analysis, hydrology, and hydrogeology studies, restore Alewife Brook to a more natural state by removing the concrete culvert. Investigate establishing a connection between Alewife Brook and the cattail marsh in order to enhance the area's wetlands and flood retention capacity.
5. Upgrade Bicentennial Park so that the area better complements the adjacent park land. Install lighting and directional signage. Repair the bridge railings on both sides of the Massachusetts Avenue bridge.
6. Mitigate the impacts of utility manholes, gas farms, and other utility line access points on the park land. Regrade and lower the utility access to below-grade installations of these facilities where possible. Develop an interpretative program involving graphics and perhaps sculpture to explain the existence and purpose of these utility lines.
7. Install information signs at Bicentennial Park and at the new wooden bridge across the brook. These interpretive graphics could discuss the historical significance of this place, especially the Menomomet Indians' fishing weir and the annual alewife migration at the Bicentennial Park area. Install signage at selected "gas farms" to explain the existence of the utility lines.
8. Consider installing sculpture in the rotary area that highlights the history of the immediate area and serves as a landmark for commuters, walkers, naturalists, and cyclists.



Segment Character

Segment Two is bounded by Massachusetts Avenue to the south and Broadway to the north. Arlington is west of the brook and Cambridge and Somerville are east of it. The Alewife Brook is still contained in its concrete culvert along the entire length. The brook is fenced until the Henderson Street Bridge, where the brook widens but is retained by two high concrete retaining walls.

Whether walking or driving along Alewife Brook Parkway, St. Paul's Catholic Cemetery provides a pleasant, green view for the passerby. The park land is very narrow west of the parkway here, and even more narrow on the east side of the parkway. The park land on the neighborhood side of the brook is natural and unspoiled with dirt jogging paths through it. St. Paul's Cemetery is inaccessible to park users. The retaining walls that contain the brook in the graveyard area are seriously deteriorating concrete with metal railing atop them.

Alewife Brook is screened from view by the dense knotweed growth and trees along the banks. One is not conscious of the water until nearing Henderson Street. Although the Henderson Street Bridge is too narrow for two-lane traffic, the bridge affords some lovely views of Alewife Brook. There is a metal gate west of the Henderson Street Bridge that prevents cars from entering the park land. North of the gate is an open area where youths "hang-out." Neighbors complain that litter which accumulates here attracts rats. Despite the undesirable activities which sometimes occur, the area is pleasant and affords easy access to the water's edge where people enjoy feeding ducks.

On the eastern side of the parkway, the land uses range from commercial (Mobil Station), to institutional (the Immaculate Conception Church), to residential, including the multi-story public housing project in Somerville. Because of the rise in grade of the parkway at the Broadway intersection, drivers have some trouble negotiating the intersection, which adds congestion for parkway users.



View of St. Paul's Cemetery from Alewife Brook Parkway

Short-term Improvements

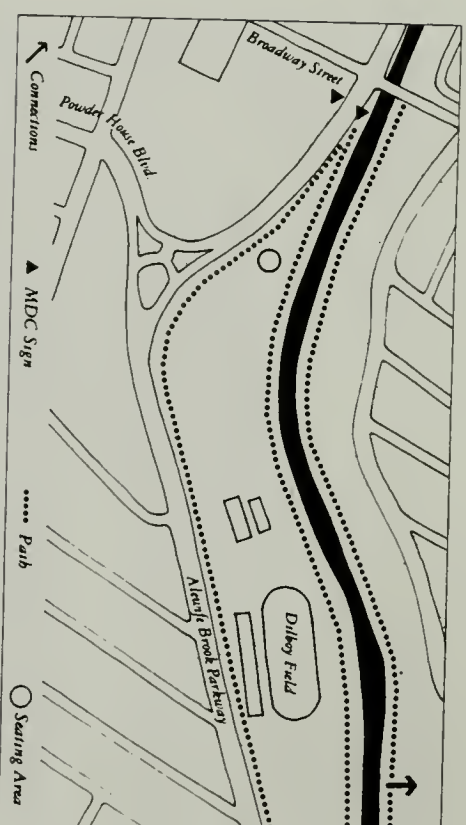
1. Remove the chain link fence along Alewife Brook. Leave any mature specimen tree that is a native and appropriately placed.
2. Install historic MDC park lights along the parkway.
3. Investigate the limits of ownership of the Mobil Station. Encourage the owner to replant the station edges with large shade trees. Encourage the Church to plant large shade trees along their parking lot to improve the view.
4. Consider closing the Henderson Street Bridge to vehicular traffic, with neighborhood consent, and designating it as a pedestrian bridge. Repair bridge railings to make them safe for this use.
5. Install new granite curbing, with a ten-inch curb reveal, along both sides of the parkway to separate the cars from the park. When installing the new curbing, regrade where utility manholes intrude in the landscape.
6. Create a woodland walk (stone dust or wood chip path) along Alewife Brook's neighborhood side and plant shade-tolerant native wildflowers and wetlands shrubs such as rhodora. Create an open seating area, a quiet place, north of the bridge where people can enjoy views of the brook and feed the ducks.
7. Close off the dangerously narrow dirt path on the eastern side of the parkway to pedestrian traffic by installing a metal guardrail along the entire area from Woodstock Street to Broadway.
8. Install four new MDC directional signs for cars at the corners of Broadway.
9. Inspect the concrete retaining walls that line the Cemetery area to ascertain structural damage. The taller retaining wall, on the east side of the brook, shows signs of real deterioration when examined from the Cemetery. The railing on top of this wall appears to be in poor condition. The western wall should also be examined carefully by a structural engineer to ascertain its stability and condition. No work in this part of the segment should be done until the area is safe for increased pedestrian and bicyclist use.
10. Replace the missing or dying large shade trees along the parkway with species of red oaks and red maples that withstand urban conditions. No other tree planting is necessary in this segment.

11. Clean up trash on a scheduled basis to control the rat problem. Comprehensive maintenance should include care of mature and new trees, lawn care, trash pickup and eventual removal of all vegetation growing in the chain link fence on the neighborhood side of the brook.

Long-term Recommendations

1. Restore the Alewife Brook to its former natural state from the Massachusetts Avenue Bridge to the Henderson Street Bridge. Remove the chain link fence and vegetation in the fence on the neighborhood side. Establish bank stabilization measures.
2. Install a bituminous multi-purpose path on the brook's parkway side which connects to Segments One and Three. The existing sidewalk will need to be widened.
3. After consulting with traffic engineers, rework or re-stripe the Broadway intersection for safer vehicular movement.
4. Investigate public access through the MDC park land on the Cemetery side of the brook with the Cemetery owners. Cemetery owners might identify another path location that could link the bikeway to Broadway. Install stairs from the Cemetery grade level up to the Broadway grade level.
5. Encourage the placement of town entry signs on city land and not on MDC land.
6. Install four information signs for the pedestrian or biker at Bicentennial Park, at the Henderson Street Bridge, and at the St. Paul's Cemetery seating area. These educational signs would direct the park users, but also inform them about the annual Alewife and herring migration, the history of the Cemetery, and about the native plants that line the woodland path.

C. Segment Three Dilboy Field Broadway to Mystic Rotary

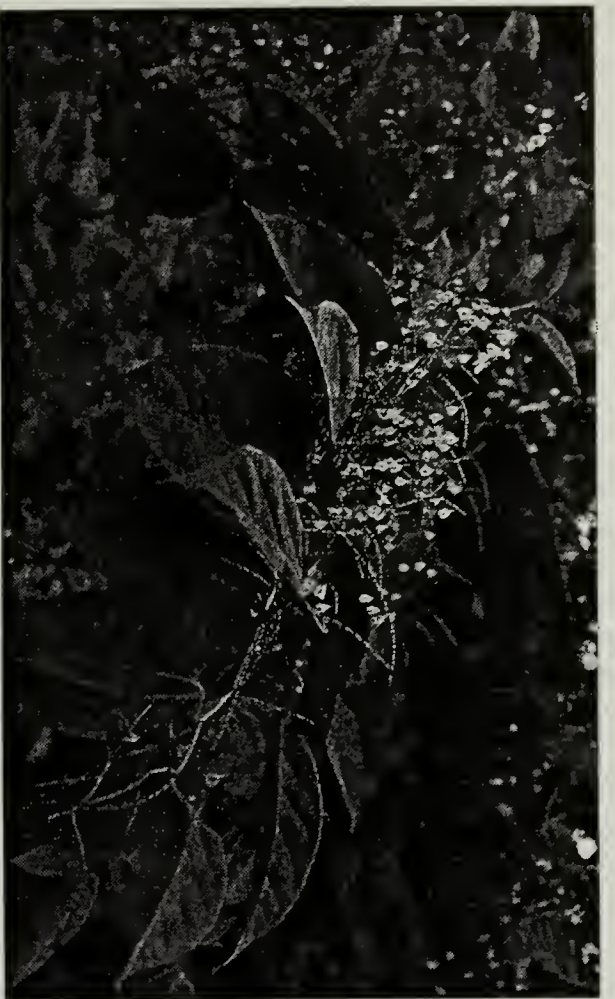


Segment Character

Segment Three is bounded by Broadway and by the rotary at the junction of the Alewife Brook and Mystic Valley Parkways. Arlington is west of the brook and Somerville is east of the brook. Tufts University is located three blocks from the project site.

The segment is dominated by the active recreational facilities at Dilboy Field. These facilities include a football field and stadium, a large parking lot in disrepair, a pool facility, basketball and tennis courts in disrepair, two softball fields, and an outdated and little-used children's play structure.

The parkway's eastern edge is predominantly residential, with a large public housing project located at the Powder House Road rotary. The commercial abutters include Johnny Foodmaster, a liquor store and two gas stations.



Invasive knotweed, Polygonum verticillatum, needs to be removed and monitored yearly

Besides the MDC facilities, there are two former MDC buildings that are currently under the control of the MWRRA. While the park lands east of the brook are dominated by the sports facilities, the park lands west of the brook are natural and open. Neighbors in the Sunnyside area reported that fires are frequent in the summer in the knotweed and overgrown grass.

The Alewife Brook is fenced almost continuously on the Dilboy side and partially on the neighborhood side. Japanese knotweed blocks the view to the water. As in the first two segments, old combined sewer/storm outfalls empty into the brook. There is evidence of a wide variety of wildlife along the banks.

Short-term Improvements

1. Remove the chain link fence along both sides of the brook. Subject to permitting and conservation commission review, control the knotweed by controlled spraying with wetlands "Roundup" right before the knotweed blossoms come out in late July or early August. Leave any mature specimen tree that is a native and appropriately placed.
2. Install the historic MDC lights along the parkway.
3. Strengthen the park lands' edge by removing the tall chain link fence along the parkway and by installing a lower, more park-like fence.
 - a. Remove the chain link fence along the parkway near the Broadway Bridge and establish a seating area with outdoor barbeque in the more level section. There may have to be removal or transplanting of the recently planted white pine trees in this area to improve picnickers' visibility at all times.
4. Install new granite curbing, with a ten-inch curb reveal, along the entire parkway alignment and at the Powder House Road rotary. When installing the new curbing, regrade areas where utility manholes intrude onto park land.
5. After consultation with traffic engineers, install three new signalizations along this segment, one at Woods Avenue, another one at the public housing project, and one near the Mystic Rotary to connect Segments Three and Four.
6. Install five new MDC directional signs for cars at the corners of Broadway, and at the three entrances to the Mystic Rotary.
7. Landscape improvements: replace the missing or dying large shade trees along the parkway and in the parking lots at Dilboy with species of red oaks, sycamores, or red maples that withstand urban conditions.
 - Plant trees in front of the Johnny Foodmaster and Dilboy Field parking lots.
 - Investigate the limits of ownership of the gas stations and the MDC land and encourage the stations to plant their parkway edge with large mature shade trees.
 - Plant large shade trees in front of the "parking lot" south of the MWRRA building.
 - Large wetland specimen trees could be planted on the neighborhood side of the brook.

- Investigate getting a neighborhood garden club or other volunteer group to adopt the Mystic Rotary, to plant it with perennials and assist with maintenance.
 - Reseed the neighborhood side of the brook with meadow grasses containing native New England wildflowers, to encourage passive uses but also to cut down on lawn maintenance.
 - Remove the evergreen trees and shrubs that hide the entrance to the pool area and make the complex appear unsafe.
8. Formalize the dirt paths on the neighborhood side of the brook with the installation of a woodland path with a soft surface. The path could meander through the meadow grass and should be connected to Broadway by a set of stairs.
 9. Maintain park land in this segment and include care of mature and new trees, lawn and perennial care, trash pickup, continuous knotweed monitoring and removal, and twice-a-season mowing of the meadow grasses on the neighborhood side of the brook. Sport facility maintenance could be undertaken by participating organizations but should always include field aeration and care on a seasonal basis.
- Long-term Recommendations
1. Restore the Alewife Brook to its former natural state by stabilizing its banks.
 2. Install a combined bike/pedestrian pathway on the parkway side of the park land, which will connect this segment to Segments Two and Four. Connect this pathway to the neighborhood side of the park land with a pedestrian wooden bridge near the Dilboy pool facilities.
 3. Renovate the Dilboy Facilities:
 - a. Initiate a hydrological and hydrogeological study of the Alewife Brook floodplain area to understand why the Dilboy Field area and the park lands on the Sunnyside neighborhood have poor drainage, sodden soils and other water problems. This study should be undertaken before any Dilboy improvements are done so that the footings, structures and field reconditioning can be designed properly to withstand the wet conditions.
 - b. Upgrade stadium building and facilities by making the repairs recommended in the "Study of Leakage and Structural Deterioration, Dilboy Field Stadium, Somerville, Massachusetts" by Simpson Gumpertz & Heger Inc., May 1989, before more costly construction is considered.

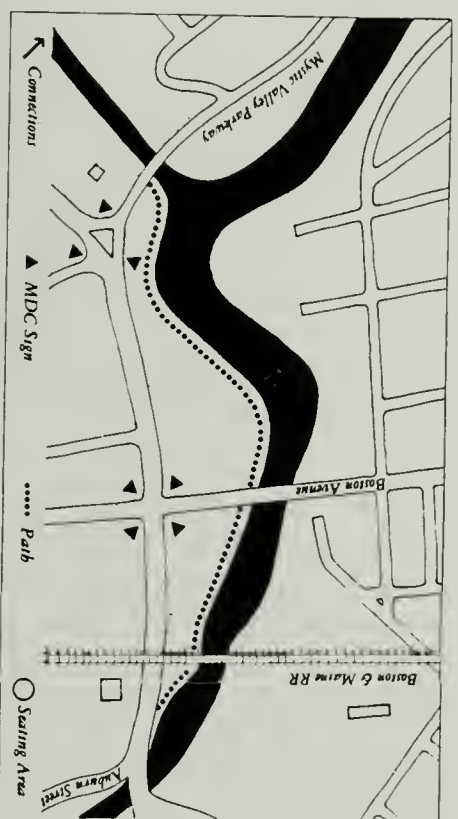
- c. Renovate the current drainage system at the football field after the hydrological and hydrogeological studies are completed. Rework the soils of all fields, if necessary, to provide a drainage layer below the playing surfaces.
- d. Renovate the pool and shower facilities. Check the structural integrity of the concrete retaining wall around the pool area. If sound, make cosmetic improvements to its surface.
- e. With City of Somerville officials, study the possible location of an MDC skating rink at the Dilboy area so that more active MDC recreational facilities could be located in one area.
- f. Remove the outdated children's play structure and install a new, more visible, multi-use structure or structures closer to the pool area and adequate parking. Fence the entire play area to keep children inside and to keep balls, and dogs out of the area.
- g. Reorganize the large parking lot north of the Stadium to increase efficiency and to include 185 spaces. Plant shade trees in the lot to make the lot appear more park like.
- h. Rework the vehicular circulation at the entrances to the Stadium and in front of the Stadium, not only to make the vehicular circulation work more efficiently, but also to replace some of the asphalt with planting.
- i. Remove the old tennis courts. Replace with four new basketball courts. (No tennis courts are included here because there are four public tennis courts in excellent shape less than one-quarter of a mile away on the Mystic River.)
- j. Renovate the field area south of the football field so that the fields are well drained and can be used more of the year. Retain the softball use with one league-size field, one little league field, and the potential to re-stripe the area into a football field after softball season. Install adequate seating and lighting for these uses.
- k. Maintenance in this segment is the most intensive, so maintenance facilities and staff should be located in this complex. Renovating the Stadium facilities and garage is a possibility, as is the reuse of part of the former MDC pumping station building.

4. Negotiate possible use of the former MDC pumping station with the MWRRA as a ranger station for the entire project area. A staff of five park rangers, housed in this building, could provide the constant supervision and educational outreach needed in this area. Mounted rangers could be considered for the future.
5. Install four new information signs for pedestrians and bikers at the Dilboy parking lot, at both sides of the pedestrian bridge, and at the seating area near the Broadway Bridge. These signs would direct the users to the sports facilities, bike path, future canoe launch and ranger station, and would also educate the public about the wetlands and about the Menotomet Indian history of the immediate area.

D. Segment Four

Mystic River and Alewife Brook Confluence

Mystic Rotary to Auburn Street



Segment Character

Segment Four is an especially beautiful area which affords, from the Mystic Valley Parkway, occasional views of the Mystic River. Medford is northwest of the river and Somerville and Medford are southeast of the river.

Two mature oak groves make the park land attractive and well used at all times of the year. Wildlife inhabit the banks of the river. Commercial abutters such as the U-Haul Company, a liquor store, and Purity Supreme detract from the parkway character because few mature trees screen their facilities and provide a green buffer between the parkway and the parking lots. There is a problem area under the commuter rail tracks which is frequented by homeless people.

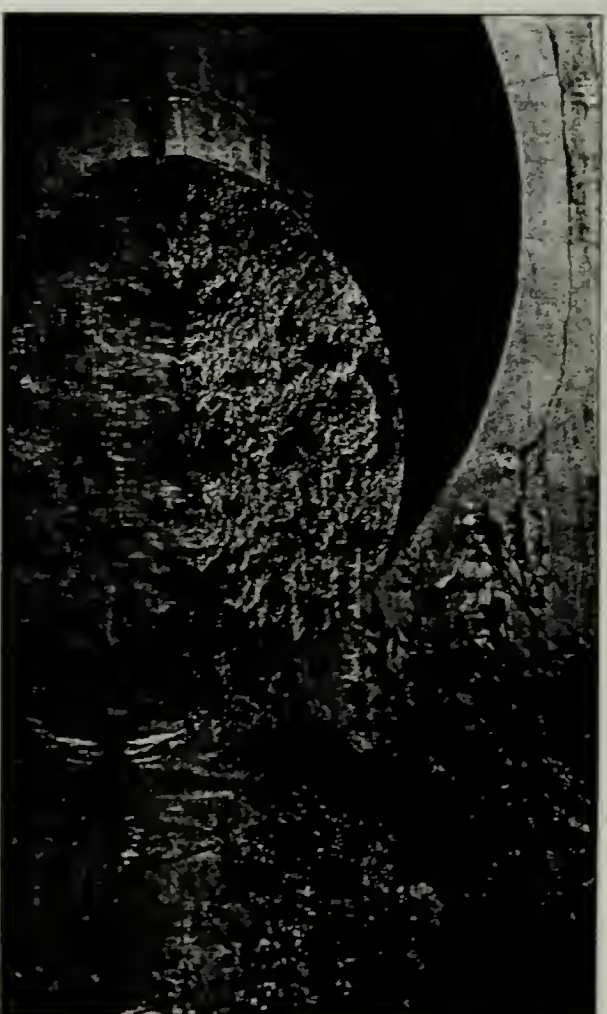
The parkway is flanked by a residential neighborhood comprised of two-family houses. Large shade trees line many of the sidewalks. The neighborhood side of the Mystic River offers a wide, sunny expanse of land that is rich with Indian History. The Menotomet Indians had their permanent winter camp here.

Short-term Improvements

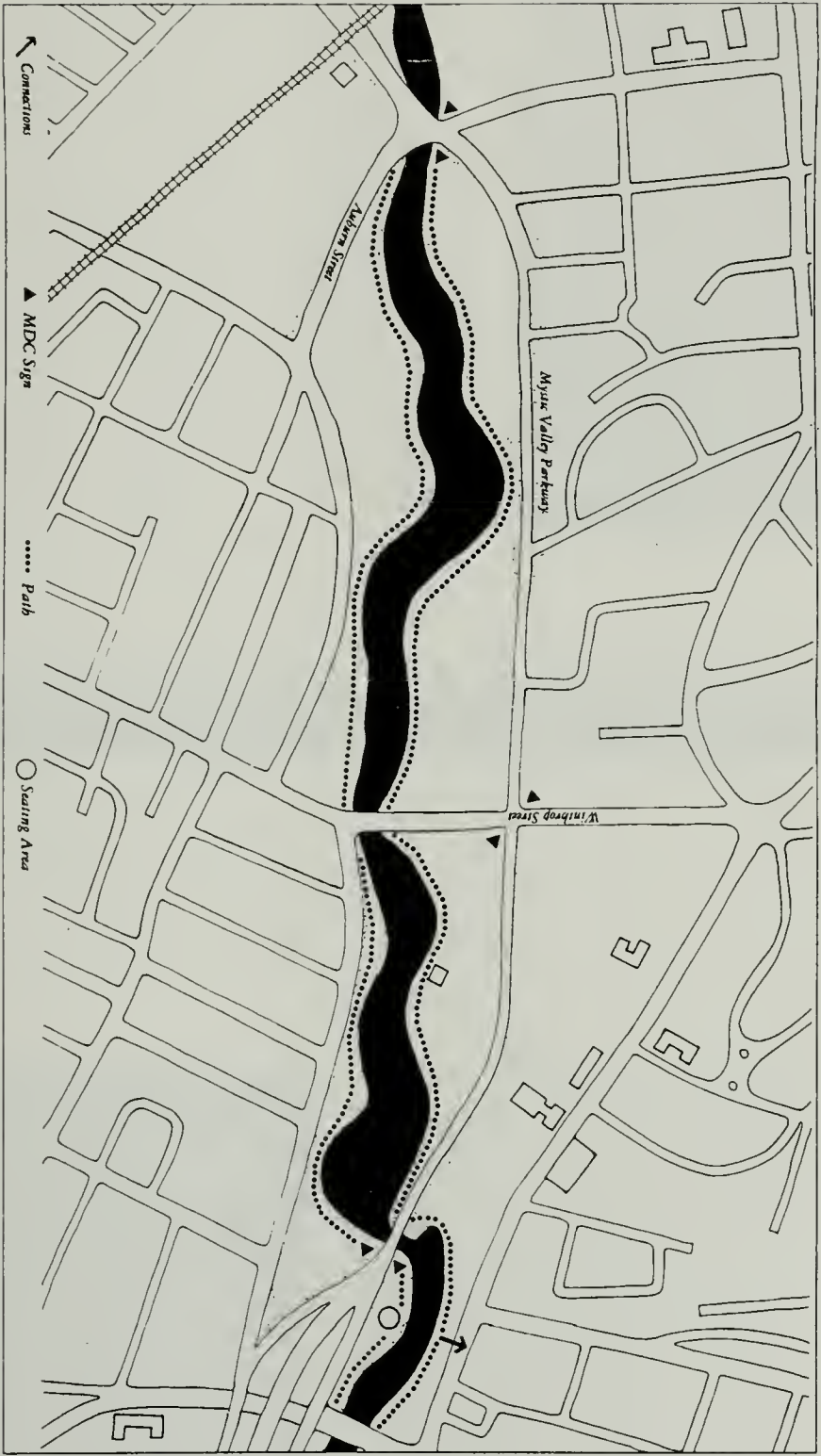
1. Selectively remove some vegetation along the Mystic River banks to open up the views to the river from the parkway.
2. Install new granite curbing with a ten-inch curb reveal along both sides of the parkway and along Boston Avenue to the bridge, to establish the park land identity and separate it from the vehicular traffic.
3. Install the historic MDC park lights along the parkway.
4. Landscape improvements: replace the large shade trees along the parkway with species of red oaks, red maples or sycamores that can tolerate urban conditions. At the edge of the Purity Supreme parking lot, renovate soil and plant with new shade trees.
 - a. Replant the "soldier" Euonymus that were planted at the base of the commuter rail embankment with a more naturalized planting.
 - b. Monitor the health of the mature oak trees in the two groves on an annual basis. No other new tree planting is necessary in this segment.
5. Repair the capstones on the Auburn Street Bridge.
6. Remove the rusty backstop that has oak branches growing through it.
7. Maintain park land in this segment and include tree care, lawn care, trash pickup, and monitoring of bank stabilization.

Long-term Recommendations

1. Establish this segment of park land as a permanent passive recreation and wildlife habitat zone.
2. Install the combined bike/pedestrian pathway connecting this segment to Segments Three and Five. To avoid conflict with the parkway, the proposed bikeway can be safely connected under the tunnel on a wooden bridge on piles.
3. Develop programs to inform people about the area's rich history; investigate past archeological digs and encourage talks by the park rangers to area school children.
4. Install four new MDC directional signs for car users and five new information signs for the pedestrians. The information signs would be near the banks of the Mystic River and overlooking the Auburn Street Bridge. These could inform the public about the water uses of the Mystic River and about Indian history.



Peaceful water rises which only a concert can appreciate now



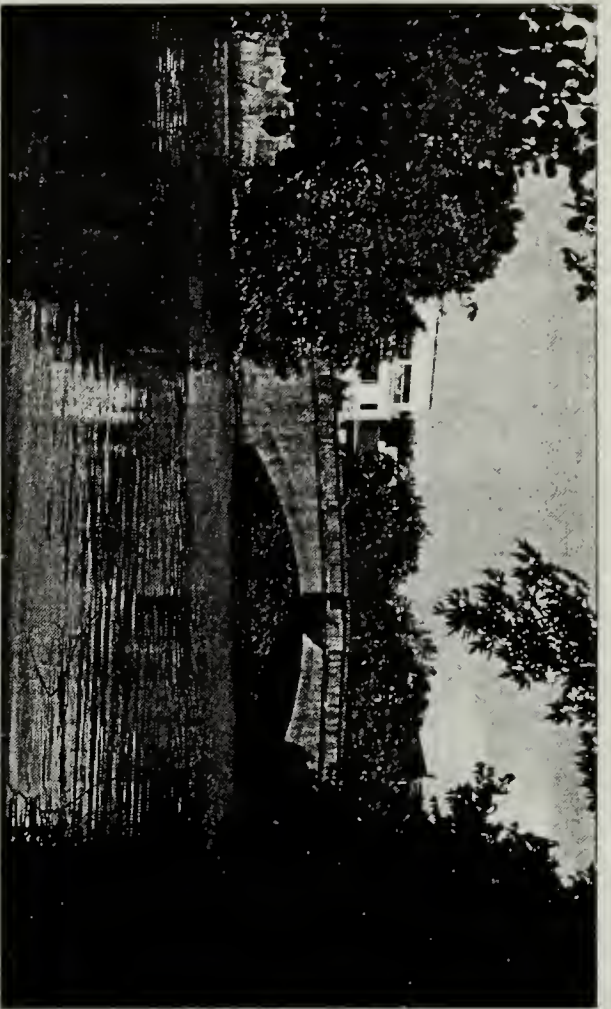
*Medford Segment
Auburn Street Bridge to the Intersection of Route 93*

Segment Character

Segment Five, like Segment Four, has great natural beauty and a true parkway character. Views to the Mystic River are possible in the winter and occasionally in the summer when the knotweed is not too dense. The park land on the parkway side is wider than in any other segment in the project area.

The Condon Shell has great potential as a gathering place, and there are three popular ball fields used by the City of Medford and others. There is an under-utilized parking lot close to the Route 93 intersection. Its close access to the river encourages illegal dumping in the river. A stream runs north from the Mystic River and used to extend into the once-rural neighboring land. An old fish ladder near the parkway is little used now as the stream appears to die under the parkway. There are vent and manhole intrusions in this segment.

Some mature planting along the river banks cannot thrive because of heavy knotweed infestation and there has been some bank erosion. On the river's neighborhood side there are serious encroachments along the river bank. Private boat ramps on this side of the river occupy public property.



Connection from Medford Center to Park land by Medford Square Foot Bridge

Short-term Improvements

1. Landscape improvements: selectively remove and prune some of the vegetation along both sides of the Mystic River to allow views to the water during every season of the year. Eradicate the knotweed and highlight the native wetland species, like the white and gray birches and the blackberries.
 - a. Replace the large shade trees along the parkway with new red oaks, red maples or sycamores that can withstand urban conditions, especially at the Route 93 end of the parkway. Plant native, wetland specimen trees and shrubs in the open areas of this segment to highlight unusual tree species that will be interesting to the general public and will provide wildlife habitat.
 - b. Eliminate or transplant the trees around the Condon Shell for a better designed condition. After the redesign of the area has been done, the trees need to be thoroughly pruned and thinned to open up views.
2. Install new granite curbing along both sides of the parkway and along Winthrop Street to the bridge, to more effectively separate the cars from the park land users, and to clearly identify the park land use.
3. Install historic MDC park lights along the parkway.

4. Install six new MDC directional signs for cars at the beginning and end of the Route 93 ramp, at either end of the Auburn Street Bridge, and at two corners of the intersection of Winthrop Street and the parkway.
5. Maintain park land in this segment and include care of mature and new trees, lawn care, trash pickup, and ball field and play area maintenance.

Long-term Recommendations

1. Install a combined bike/pedestrian path connecting this segment to Segment Four and Medford Center. Begin to explore links to the commuting bike routes to Boston that parallel Route 93. These bike paths should be on the parkway side of the river, running close to the river and also along the parkway itself. Exercise stations could be installed along the pedestrian pathway closest to the water. During detailed design phases, a wider, model trail accommodating the pedestrian, the jogger, and the bikers should be considered, because there is sufficient land available in this segment.
 - a. Install a hard surface path for pedestrians and bikers in the wide expanses of land on the neighborhood side of the public park land. Where the public access is close to the residences, install a soft surface woodland path for pedestrian use. Develop the woodland path theme about local wetland plant species and associated wildlife for park ranger interpretation.



Example of historic MDC parkway character of large shade trees and grass in Medford

2. Ball field redesign:

- a. Investigate the usage of all three ball fields during the summer season to determine whether all three fields are necessary. If not, remove the least used field so that more open space can be available to park users for a greater part of the year. Install more park-like, less maintenance-intensive fencing at the ball fields so that the ball fields will blend better into the natural landscape.
 - b. At present, users use the side streets near the fields for parking. With increased usage of the area, parking may become a problem and a small parking lot for not more than 20 cars should be considered.
3. Connect Medford Center to this park land area by reestablishing the picnic area underneath the mature trees on the city side of the park land area. When the pruning of the Medford Square Foot Bridge plantings is completed, the close views to the water will attract users to this beautiful area.
 4. During the detailed design and construction phases of the project, reconnect this park land area and pathway system to the "Lost Acre" to reconnect the broken link into Boston from the western suburbs. This link could also be reestablished through water uses, like canoe use of the Mystic River, Mystic Lakes and Alewife Brook.
 5. Condon Shell area: Rework the parking lot near the Condon Shell to make it more efficient, park like and further away from the water's edge. The MWRRA is planning work in this area, so any improvement plans should be coordinated with their efforts.
 - a. Incorporate a new children's play area near the Condon Shell and redesigned parking lot. The play area should be divided into age appropriate equipment groups, from 0 - 4, and 5 and older. The equipment should be colorful and provide a variety of play opportunities.
 6. Install a canoe launch on the parkway side of the river in an area close to the redesigned parking lot, so that canoeists can easily carry their boats to the launch area.
 7. Install about six new information signs at the canoe launch, the redesigned parking lot, the Condon Shell, the ball field area, the exercise trail head on the parkway side of the river, and at the woodland trail end on the West Street side of the river. These educational signs can inform the public about the pathway and bicycle network, about the wetland plant species in the area, about the water uses on the Mystic River and Mystic Lakes, and about the history of the Medford area.

IV.

Acknowledgments and Footnotes

Metropolitan District Commission

Julia O'Brien, Director of Planning
John Krajovic, former Alewife Planner and Project Manager
Dan Driscoll, current Alewife Planner and Project Manager

Brown and Rowe, Inc.

Landscape Architects and Planners

Clarissa Rowe, Principal-in-Charge
Nina Brown, Principal, Editor
Ann Frick Blair
Catherine Cagle
Emilie Stuart, Editor
James Summers

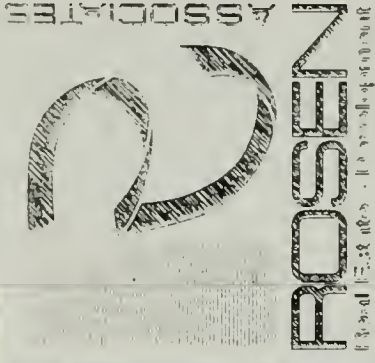
Jon Roll & Associates

Graphic Design

Jon Roll, Principal-in-Charge
David Cajolet, Project Manager

Appendix H

Gateway Center Proposed Park Conditions



LEGEND

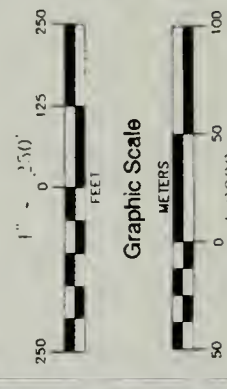
○	EXISTING TREES
●	PROPOSED CANOPY TREES
◐	PROPOSED FLOWERING TREES
◑	PROPOSED SHRUBS
○	WILDFLOWER AREAS
—	MOWED EDGE

REFER TO CHART 2 FOR DETAILED PARK LAYOUT

Pressley Associates, Inc.
 Landscape Architects
 425 Columbia Street
 Cambridge, MA 02142
 Phone (617) 452-2500 Fax (617) 452-2501

LEGEND

—	PROPERTY BOUNDARY
—	PARCEL BOUNDARY
—	EASEMENTS
—	EDGE OF WATER
—	WETLAND BOUNDARY
—	100-FT WETLAND BUFFER ZONE
—	100-YEAR FLOODPLAIN
—	EXISTING STREETS AND ROADS
—	PROPOSED STREETS AND ROADS

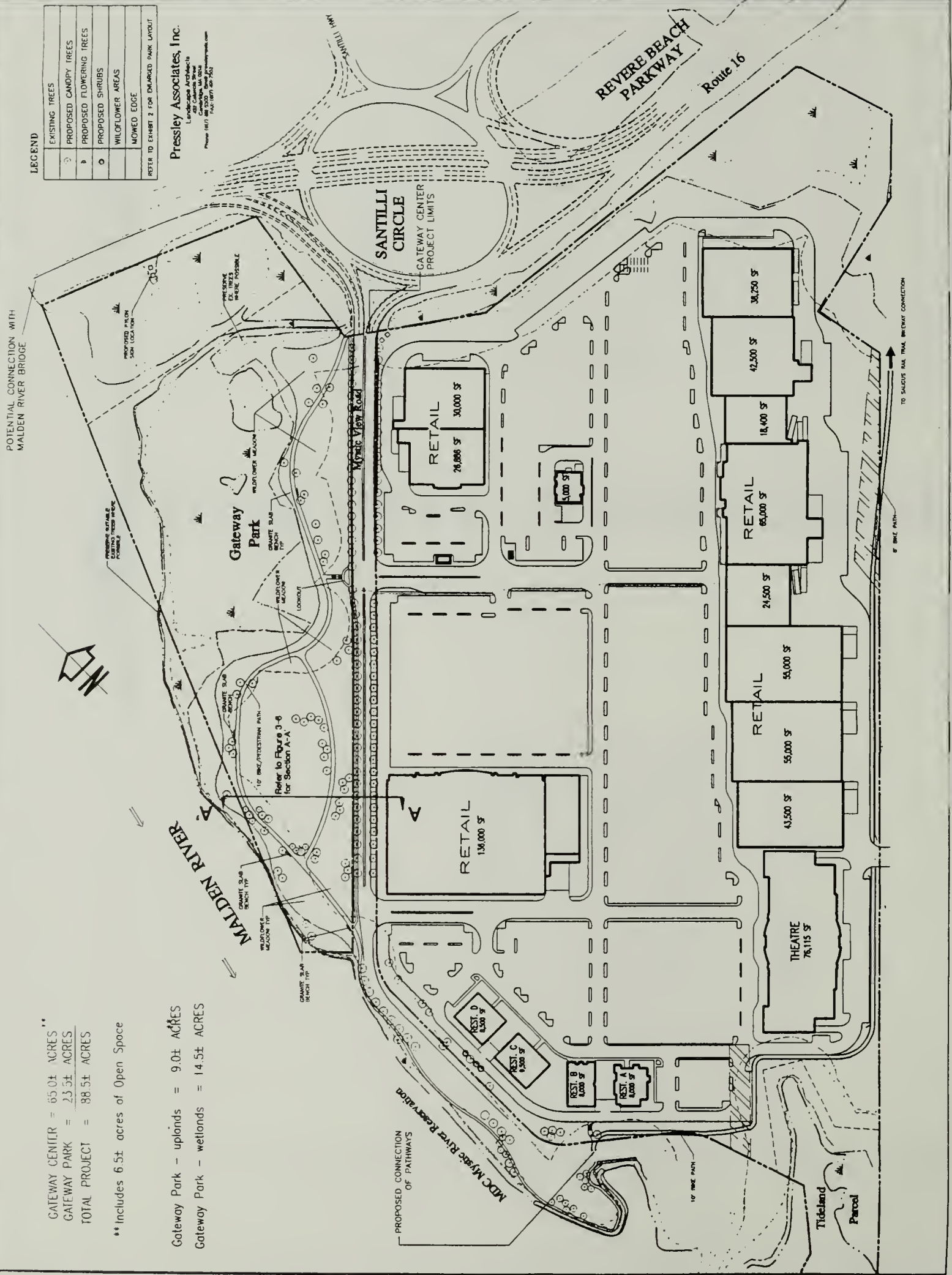


BEC BAYSTATE ENVIRONMENTAL CONSULTANTS INC.
 Engineers 286 North Main Street
 Scientists East Longmeadow, MA 01023
 Surveyors

Gateway Center Project
 Final Environmental Impact Report
 EOE NO. 10510 June, 1997

Figure 3-9

Proposed Gateway Park Conditions



GATEWAY CENTER = 65.0± ACRES
 GATEWAY PARK = 23.5± ACRES
 TOTAL PROJECT = 88.5± ACRES

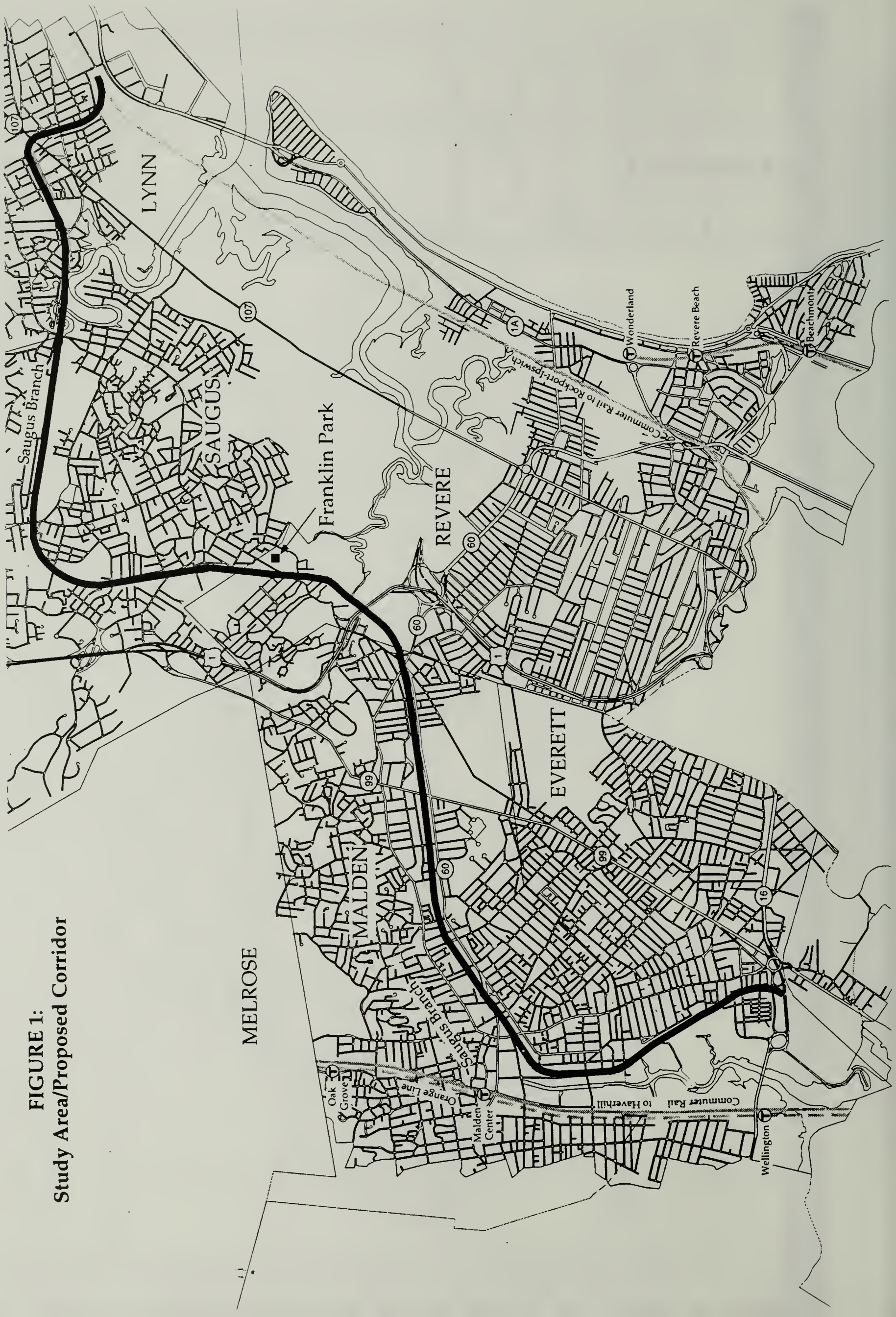
** Includes 6.5± acres of Open Space

Gateway Park - uplands = 9.0± ACRES
 Gateway Park - wetlands = 14.5± ACRES

Appendix I

Bike-to-the-Sea: Study area and proposed corridor

FIGURE 1:
Study Area/Proposed Corridor



Appendix J

Community Interest and Contacts

NORTHWEST

WEEKLY

The Mystic's cloudy waters

Groups try to clean
a river befouled
by years of abuse

By Diana Brown
GLOBE CORRESPONDENT

MEDFORD — On a steamy day last week, Dwight "Shay" Collins stood on the banks of the Mystic River and inhaled the nauseating stench, resembling that of rotten eggs.

"Isn't that nasty?" said Collins, a longtime West Medford resident who lives along the river and is a member of the advocacy group, Friends of the Mystic River. "It gets worse. It goes on like that for days and weeks at a time."

The river flows from Mystic Lakes to Boston Harbor through Medford, Arlington and Somerville. Its foul odor near downtown Medford is one of several aspects of the waterway that researchers and residents are investigating.

They are also examining high fecal coliform counts flowing down from Alewife Brook, chemical pollutants in sediment, wildlife habitats of night heron, swans and muskrats, and deposits of car batteries, trash and tires dumped near Route 93. Even the river's historical, cultural



GLOBE STAFF PHOTO / MICHAEL QUAN

Dwight "Shay" Collins of Friends of the Mystic River and Anne Livingston of the Massachusetts Riverways Program test the waters near the High Street Bridge in Medford.

and environmental benefits are getting attention.

Several groups, including the Friends of the Mystic River, Tufts University, Alewife/Mystic River Advocates, Medford High School students, Brooks/Hobbs Magnet Middle School students, the Massachusetts Riverways Program, the

Metropolitan District Commission and the Environmental Protection Agency, have taken an interest.

"There's a lot of things happening on the Mystic," said Anne Livingston, assistant urban rivers coordinator for the state riverways program. "I'm seeing it all around

MYSTIC RIVER. Page 2

■ MYSTIC RIVER

Continued from Page 1

the urban environment. People are starting to see the importance rivers have as they flow through the middle of a community. They can be beautiful open spaces."

In the past, most people scoffed at rivers, believing they were polluted by nearby industries. But now, Livingston said, communities are rallying in support of cleaning up and protecting their rivers.

Yesterday, a twice-annual on-shore cleanup was scheduled for the Mystic. A spiritual healing service is scheduled along the banks in August or September by Rev. Dorothy Emerson, cochairwoman of the Friends of the Mystic River and a local Unitarian-Universalist minister.

"We feel there is a kind of mystical aspect that is part of creation, like from Genesis, something God has given us," said Mike O'Brien, co-chairman of the 75-member Friends group, founded two years ago.

And this fall, Janey Keough, a member of Alewife/Mystic River Advocates and operations director of Save the Harbor/Save the Bay, is planning historical tours of the river. At least one tour, she said, will focus on clipper ship building since the grand boats were once constructed in the river's tidal waters between Somerville and Everett.

"It's history that is really significant to Medford," said Keough, a Medford resident who said many folks do not know about this part of the city's illustrious past.

But interest in the history of the river does not overshadow concern for its health and vitality, both of which are in question. John Durant, an assistant professor in civil and environmental engineering at Tufts, is heading up several studies on the Mystic and its Alewife and Mill Brook tributaries.

Along with three undergraduate and graduate students, they are investigating the history of companies that operated nearby, the kinds of chemicals that were used, and how they were disposed. The researchers intend to get this information by

closely studying the sediment deposits in the riverbed.

In the Medford area are retail stores built up right along the river. Closer to Boston Harbor, there is the Meadow Glen Mall, Assembly Square Mall and a large car dealership.

A Boston Edison plant is also on the river's banks, and vessels carrying oil and natural gas ply its waters.

The former Monsanto chemical plant was located at the confluence of the Malden and Mystic rivers, and pollution and contaminants can come from farther afield.

While at MIT a few years ago, Durant and two other professors, Harry Hemond and William Thilley, did studies of the Aberjona River in Reading, Woburn and Winchester.

They found high concentrations of arsenic, lead and other contaminants left behind from chemical and tanning companies that thrived along the river from the 1860s onward.

The Aberjona now has two Superfund sites and 50 hazardous waste sites in the 25-mile watershed. By examining the pollutants, he said, they could connect them to industries; they hope to do the same with the Mystic.

Durant said his current research team is looking for fecal coliform counts to determine if sewage, running through several Massachusetts Water Resources Authority pipes along the Mystic River, is seeping in, or if other sewage and septic leaks are to blame.

Their test sites include the dam between the Upper and Lower Mystic Lakes, Mill Brook, the Route 60/High Street bridge and Alewife Brook, which flows into the Mystic.

A 1993 MWRA study found that the Alewife Brook was "grossly polluted," with average sewage bacteria levels in wet weather running as much as 10 times as high as acceptable state standards.

Four years later, the fecal counts still seem to be high. "That's been disappointing," said Larry Kravitz, a teacher at Brooks/Hobbs Magnet Middle School who regularly does fecal, dissolved oxygen, sediment, clar-

ity and PH tests of the river with his seventh grade classes.

A Medford High class also did some monitoring recently and found high fecal counts, particularly around Alewife Brook. The high levels alerted the Friends group which won a \$2,400 Massachusetts Riverways grant to help the Tufts students research the problem.

"We're trying to rake it all in and make sense of it," Durant said.

O'Brien, the Friends of the Mystic River cochairman and an environmental engineer with the EPA's hazardous waste programs unit, said the Friends need to continually monitor the river. "At the very least, I consider us watch dogs because the river could improve but it could also slip back."

They are now keeping close watch over Telecom City, a proposed 200-acre telecommunications research park spanning Malden, Everett and Medford along the Malden River, which flows into the Mystic. Specific plans, which call for a bridge over the Malden River, are expected by October.

With the success of Boston Harbor's cleanup, renewed interest in the Mystic comes at a good time. Many people are realizing that the harbor's health is secure only if the waterways flowing into it are clean.

"We know it's time to look inward," said Keough of Save the Harbor/Save the Bay. "There are so many people who live in the watersheds."

For Shay Collins, who grew up fishing and swimming in the Ohio River in Kentucky and now lives across from the Mystic, having green space and water nearby is essential. "It's a valuable asset that has to be taken care of," he said.

► For more information about the Alewife/Mystic River Advocates tours in the fall, contact Jane Keough at (617) 393-8132. For information about Mystic River events or cleanups, contact the Massachusetts Riverways Program, (617) 727-1614, or Friends of the Mystic River at the Unitarian-Universalist Church of Medford, (617) 396-4549.



Riverways Programs

Maria Van Dusen, *Riverways Coordinator*
Joan C. Kimball, *Adopt-A-Stream Coordinator*
Russell A. Cohen, *Rivers Advocate*
Karen I. Pelto, *Stream Ecologist*

TO: Mystic River Watershed friends
FROM: Maria Van Dusen, Coordinator, Mass Riverways Program
Anne Livingston, Urban Rivers Program
DATE: August 1, 1997
SUBJECT: Follow up to the July 24th "Show & Tell" for the Mystic River Watershed

A big thank you to everyone who attend the Mystic River "Show & Tell", and to Laurie Bennett of Habitat who hosted us, and Carolyn Mieth of the Mystic River Watershed Association who brought us the wonderful refreshments. Along with more than thirty individuals gathered together on July 24th, we heard interesting stories about cleanups, recycling, organizing, research, greenway planing, permits, herring runs, stormwater runoff, murals, boating, land protection and much more. Groups presented their successes and discussed their needs.

A lot is happening in the Mystic River Watershed and a tremendous opportunity exists for collaboration and celebration. There is also need for increased funding and services in the watershed. To build on the success of this initial meeting, several people volunteered to get together in mid-August to discuss strategies for providing more support for ongoing activities and plan steps for follow-up in the fall.

On August 13th, Professor John Durant will be host for the planning session to be held at Tufts University from 5 to 7 PM. Those who volunteered to attend this session include Carolyn Mieth, Mary Rickel, Susan Brent, Jennifer Hill, along with John, Anne and Maria. Others are welcome. Please call Anne at 727-1614 x348 or Maria at x360, if you wish to attend.

Enclosed are copies of the sign-in sheets. We are also sending our notes and a list of some of the "needs" that were mentioned in the meeting. Please call us to suggest changes and additions. And call each other to lend your support to on-going projects.

Mystic River Show & Tell

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COMMENTS ON MYSTIC RIVER "SHOW & TELL"

IMMEDIATE NEEDS:

- Mail out names of attendees at July 24th meeting and notes (Riverways)
- Attend the August 8th Full Moon Healing Ceremony with Friends of the Mystic River
- Provide support to Brooks Estate group for August 5th vote in town for conservation preservation
- Call Krista Schneider at 727-8301 to provide information for her report on development along the Mystic River
- Call Kate LaBlanc from Tufts University with information on the historical uses of Mill Brook and Alewife Brook
- Call Steven Lewis at 732-1521 if interested in contributing to Oral Histories project. Steven is working with 7th graders at Hobbs Middle School and needs seniors interested in sharing their tales of the Mystic River.

TO DO (Short Term)

- Find a red dot pointer for John Durant!
- Give Arlington residents needed assistance in overcoming resistance to painting storm drain message in Arlington
- Assist Elizabeth Miley at Metropolitan Planning Area commission with marking the boundary of the Mystic River Watershed with ribbons tied around trees
- Provide EPA or Office Technical Assistance with information on businesses that may be polluting
- Take a walk, bike or canoe along the river, the Brooks Estate or the Alewife Reservation
- Hold a strategy session on funding sources & approaches
- Help get MDC to put signs on bridges for "No Wake"
- Provide the EOEA Watershed Team for the Mystic with this information and ask for joint meeting
- Help with media strategy to share information on Spy Pond water sampling

- Find out from Save The Harbor/Save the Bay how the storm drain detectives are solving water quality problems
- Organize forum for municipalities and Mystic River Watershed Association to discuss water quality issues

TO DO (Long Term) 12 months

- Begin to train for the second annual 10K Mystic River Herring Run in May '98
- Organize training session for all groups observing spring migration of herring (Riverways, Dept. of Marine Fisheries, MDC, Mystic River Watershed Assoc., Alewife/Mystic River Advocates)
- Plan tributary meeting for adopt-a-stream and shoreline survey groups (experienced groups could reach out and share with potential new tributary groups, Aberjona, Friends of the Mystic River, Mystic River Watershed Assoc., Alewife/Mystic River Advocates)
- Hold water quality monitoring meeting: understanding existing data, data needs, strategies, protocols, equipment (Tufts University, Save the Harbor/Save the Bay, Alewife/Mystic River Advocates, Spy Pond, Mystic River Watershed Assoc., Riverways)
- Hold work session on funding sources & strategies
- Consider having a storm water workshop for municipalities and businesses including new permit process (Northeast Business Environmental Network, Office of Technical Assistance, EPA)
- Write support letters to Dept. Environmental Protection for funding of the 319 grant for storm water improvements
- Develop priority setting recommendations for the MDC Alewife Reservation Plan (MDC, Mystic River Watershed Association, Alewife/Mystic River Advocates)
- Seek funding to implement the MDC/Halverson Plan for Medford greenway
- Consider holding a session to explore getting greenway studies upstream and downstream of Medford--possibly a charette to raise public interest and involvement (MDC, Friends of the Mystic River, Mystic River Watershed Assoc.)
- Plan for riverside exhibit by the reclamation artists
- Keep track of river bank protection and greenway in the steps to redevelop Monsanto site in Everett to become Gateway Plaza (Friends of the Mystic River)

- Attend meetings of the planning process for TeleCom city across the Malden River to keep the river cleanup and a green natural riparian area as part of the planned outcome
- Work with the MDC to find ways to design or make the greenways along the Medford River be better used and more interesting
- Provide real support to increase the MDC budget for the communities along the Mystic/Chelsea Rivers
- Work with MDC to remove shed at lower Mystic Lake
- Assist Mystic River Watershed Assoc. (Mary Gilbert & Margot Hull) with their school training program for kids learning about herring (more towns, more schools, more volunteer helpers)
- Assist Habitat with their school program for environmental education in Somerville, Medford, Cambridge
- Support open space protection efforts to save from development the 164 acres around McClain Hospital
- Help to clean up Spy Pond, possibly by looking for a source of funding
- Ask the Mass. Highway Dept. to redo the drain off Route 2 so not so much polluted runoff right into Spy Pond

Resources/Services/Expertise

Tufts (John Durant): water quality expertise, graduate student studies
 -focus on Aberjona River and lower Mill Brook and Alewife
 -developing web site on info on Aberjona River

Boys & Girls Club (Sondra Madison): canoe rentals from the Blessing of the Bay Boathouse

EPA (Carol Tucker): exploration of certain business and their practices (printing, salvage yards, storm water runoff) that may be violations; enforcement actions if warranted

MDC (Julia O'Brien & Krista Schneider): greenway protection, planning and design from Amelia Earhart Dam to Lower Mystic Lake

Friends of Mystic River (Dorothy Emerson): how to use shoreline survey, cleanups and healing rituals to build river awareness, political and community support for the river

Brooks Estate (Rob Bacon, Tom Lincoln, Mia Henderson): how to do cleanups of hundreds of tons of trash, get dumpsters, contact with state police divers to assist in underwater cleanup, explore the estate and know about historic and conservation restrictions

Winchester Greenway (Jamie Fosburgh): how to get ISTEA funds for greenway/bikeway and working with Selectmen as greenway committee of the town

Arlington Recycling Committee (Angie Taylor & Beverly): how to do just about anything with organizing a successful recycling program and promoting your efforts with bags, mugs, flyers; you name it, they have done it or will do it.

Spy Pond & Arlington 20/20 (Gene Benson, Jane Howard, Karsten Hartel): good organizing ideas (include flyers with municipal mailings) and monitoring for water issues, dealing with Mass. Highway Dept. on storm drains and water levels, pond has more underground tributaries than any other

Aleda Freeman: provide information on GIS; free software available through MASSGIS which can map GIS information on a computer screen

Mary Rickel: ideas around how to connect with and use the services of landscape designers and artists

